U.S. Army Center for Health Promotion and Preventive Medicine

USACHPPM

USACHPPM EPIDEMIOLOGICAL CONSULTATION
REPORT NO. 12-HF-01Q2A-06

INJURIES AND INJURY PREVENTION IN THE US ARMY BAND

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Readiness Thru Health

U.S. Army Center for Health Promotion and Preventive Medicine

The lineage of the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) can be traced back over 50 years. This organization began as the U.S. Army Industrial Hygiene Laboratory, established during the industrial buildup for World War II, under the direct supervision of the Army Surgeon General. Its original location was at the Johns Hopkins School of Hygiene and Public Health. Its mission was to conduct occupational health surveys and investigations within the Department of Defense's (DOD's) industrial production base. It was staffed with three personnel and had a limited annual operating budget of three thousand dollars.

Most recently, it became internationally known as the U.S. Army Environmental Hygiene Agency (AEHA). Its mission expanded to support worldwide preventive medicine programs of the Army, DOD, and other Federal agencies as directed by the Army Medical Command or the Office of The Surgeon General, through consultations, support services, investigations, on-site visits, and training.

On 1 August 1994, AEHA was redesignated the U.S. Army Center for Health Promotion and Preventive Medicine with a provisional status and a commanding general officer. On 1 October 1995, the nonprovisional status was approved with a mission of providing preventive medicine and health promotion leadership, direction, and services for America's Army.

The organization's quest has always been one of excellence and the provision of quality service. Today, its goal is to be an established world-class center of excellence for achieving and maintaining a fit, healthy, and ready force. To achieve that end, the CHPPM holds firmly to its values which are steeped in rich military heritage:

★ *Integrity is the foundation*
★ *Excellence is the standard*
★ *Customer satisfaction is the focus*
★ *Its people are the most valued resource*
★ *Continuous quality improvement is the pathway*

This organization stands on the threshold of even greater challenges and responsibilities. It has been reorganized and reengineered to support the Army of the future. The CHPPM now has three direct support activities located in Fort Meade, Maryland; Fort McPherson, Georgia; and Fitzsimons Army Medical Center, Aurora, Colorado; to provide responsive regional health promotion and preventive medicine support across the U.S. There are also two CHPPM overseas commands in Landstuhl, Germany and Camp Zama, Japan who contribute to the success of CHPPM's increasing global mission. As CHPPM moves into the 21st Century, new programs relating to fitness, health promotion, wellness, and disease surveillance are being added. As always, CHPPM stands firm in its commitment to Army readiness. It is an organization proud of its fine history, yet equally excited about its challenging future.

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14. ABSTRACT

Injury rates and potential risk factors were examined in the 264 members of the US Army Band in response to a request from the Band Commander. Collected data included 1) information obtained directly from the Band (fitness test scores, height, weight, etc.), 2) medical data from the Defense Medical Surveillance System, 3) audiograms of Band member from the Defense Occupational and Environmental Health Readiness System-Hearing Conservation database, 4) focus group interviews of Band members, *5)* questionnaire responses from all Band members and, 6) observations on Band activities. Results led to 10 recommendations including: increase physical activity and physical fitness of low fit Band members, provide enhanced hearing protection, conduct annual hearing tests, reduce environmental heat exposures, provide ergonomic devices, provide functional movement and pain management training, reduce standing and marching, provide appropriate shoes, provide uniforms for hot and humid conditions, and change chairs. Implementing some or all of the suggested interventions is likely to reduce injuries and musculoskeletal symptoms.

15. SUBJECT TERMS

physical activity, physical fitness, musician, occupational exposure, stage crew, hearing, ergonomics, heat, shoes, uniforms, chairs, pain management, musculoskeletal, questionnaire, focus group, risk factors

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EXECUTIVE SUMMARY
EPIDEMIOLOGICAL CONSULTATION REPORT NUMBER 12-HF-01Q2A-06
INJURIES AND INJURY PREVENTION IN THE US ARMY BAND

1. INTRODUCTION. In January 2006, the US Army Medical Command (MEDCOM) received a letter from COL Thomas Rotondi, Commander of the United States (US) Army Band. This letter requested that MEDCOM examine injury rates and provide injury prevention recommendations with emphasis on proper foot, ankle, and back care for prolonged standing and for the prevention of repetitive motion injuries common to musicians. The purpose of this paper is to present the findings and recommendations of the epidemiological consultations (EPICON) in support of the US Army Band.

2. METHODS. Data on the US Army Band was obtained from six major sources. The first source was historical data obtained directly from the Band. This included individual data on each Soldier's Army Physical Fitness Test (APFT) raw scores, height, weight, time in military service, arrival date at the Band, and unit; group data included historical profiles and number of missions each year. A second source of information was medical and demographic data provided by the Defense Medical Surveillance System (DMSS). This consisted of outpatient medical visits for injuries in 2004 and 2005 and demographic information (date of birth, gender, educational status, marital status and race). The third source of information was audiograms of each Band member accessed from the Defense Occupational and Environmental Health Readiness System-Hearing Conservation (DOEHRS-HC) database. The fourth source of information involved focus group interviews of a randomly selected group of 63 Band members. Focus group membership was determined based on unit, instrument, and gender stratification. Eleven focus groups were interviewed on 1) perceived risk factors for injuries, 2) experienced pain, soreness, discomfort, or injuries, 3) suggestions for reducing injuries, and 4) hearing risks. The fifth source of information was a questionnaire completed by Band members. Questionnaires contained an initial section that was group-specific for instrumentalists, vocalists, support group, and conductors; other sections involved the frequency and duration of physical activity, tobacco use, medical problems and medical care. The sixth source of information was observations on Band activities which included set-ups by the band support group (indoor and outdoor venues), two full honors funerals, a twilight tattoo, a major concert, a rehearsal, and a Memorial Day wreath laying at the Tomb of the Unknown Soldiers.

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3. RESULTS.

a. There were a total of 264 Army Band members, 209 men and 55 women. The Soldiers served in 7 separate units: blues, ceremonial, chorale, chorus, concert, strings, and support. Values for the average±standard deviation (SD) age, height, weight and body mass index (BMI) of the men were 40±8 years, 71±3 inches, 188±26 pounds, and 26.5±3.1 kg/m^2, respectively. Corresponding values for women were 39±8 years, 65±3 inches, 136±18 pounds, and 22.8±2.4 kg/m^2, respectively. Seventy-three percent (n=193) of Band members possessed Bachelor's degrees or higher degrees. The number of profiles from 2000 to 2005 ranged from 102 to 129 per year with an average±SD of 116±9. The most common anatomic locations for injury profiles were (in order of incidence) the foot/toes, knees, shoulders, upper back, wrist/fingers/hand, and the low back. Missions performed by the ceremonial unit increased 62% from 1992 to 2002, with a decline of 16% from 2002 to 2005. The average±SD number of missions per year was 748±116 from 1992 to 2002.

b. The most recent hearing test on each band member from the DOEHRS-HC database indicated that 69 band members (26%) did not have an audiometric record in the DOEHRS-HC and 118 (45%) had no test after 2001. Only 18 individuals (7%) were in compliance with annual hearing testing requirements. The absence of annual testing on Band members precluded any analysis of trends over time and attempts to portray current hearing status.

c. In the focus group interviews, the major issues had to do with shoes, clothing, activity volume, terrain and environment, instruments and equipment, and physical training. Most groups mentioned problems with the current footwear citing lack of flexibility when walking, problems during prolonged standing, lack of support, and the perception that the shoes were "hot" in the summer. Uniforms (other than shoes) were cited as not being matched to the environmental conditions (usually too "hot" in the summer), with high collars that limited neck range of motion and interfered with the playing of some instruments. Many band members cited the long frequency and duration of practices and performances as contributing to injury risk. Pain and discomfort from prolonged standing and marching were mentioned. Problems with terrain and environment included standing and/or marching on uneven ground, exposure to hot and cold environments, and playing in adverse weather conditions, especially the heat. Problems with instruments included the size and heavy weight of some (especially sousaphones, tubas, and saxophones) and the fact that drums limited the field of vision. The chorus and chorale both mentioned the discomfort of holding music notebooks for long periods. The support group differed from the instrumentalists in their mission. Although they cited many of the same problems, they also noted a lack of manpower (too few Soldiers) and their age as risk factors. Long drives and driving in traffic were noted as potential risk factors and long distances between where trucks were off loaded and where the set up occurred was also cited as a problem. The cyclic nature of missions loads (i.e., periods of intense activity followed by slack periods) was mentioned as a risk because of "deconditioning." Virtually all Band members were concerned

about hearing loss as a result of their work in the Band. The Ceremonial group was particularly concerned with their proximity to the Old Guard when those Soldiers fired their weapons. Potential hazards from the constant noise exposure were cited by the concert and chorus units.

d. The overall return on the questionnaire was 92% (243/264). Over half of the Soldiers noted that they had problems with both the shoes and the uniforms, especially those in the ceremonial and string units. The reported problems with shoes and uniforms were similar to those mentioned in the focus group interviews. With regard to hearing, <6% reported "always" wearing hearing protection, less than half "sometimes" wore protection, and over 30% reported "never" wearing hearing protection (practice, rehearsal and performance). The primary reasons for not wearing hearing protection was that it interfered with monitoring the performance of the self or others. Almost 90% of Soldiers reported they would use hearing protection if it also enhanced their ability to hear others and monitor their own performance.

e. DMSS data indicated that the Band injury visit rates in 2005 were 231 and 287 visits/100 person-years for men and women, respectively ($p=0.02$). The cumulative injury incidences (Soldiers with one or more injuries) in 2005 were 51.1% and 50.9%, for men and women, respectively ($p=0.94$). Questionnaire data indicated that 37% of the Soldiers reported an injury related to their duty assignment in 2005. The low back, foot, and shoulder and wrist were the most commonly reported injury and profile sites. Questionnaire data indicated that 64% (143/224) of the Soldiers currently experience pain, soreness, discomfort, weakness, numbness or tingling while working (musculoskeletal symptoms). The low back, foot, and shoulders were the anatomical locations with the highest symptom prevalence.

f. Factors associated with a higher incidence of documented injuries (DMSS data) were unit, functional group (i.e., brass, string, woodwind, percussion, keyboard, vocal, conductor, support-staging/lighting, support-administration), prior injury, less frequent "other" physical activity, lower self-rated physical activity, more frequent playing of primary musical instrument, vocalists who spent less time singing or dancing, and support members who spent more time in Band set-up/tear-down. For men only, higher weight, higher BMI and slower APFT 2-mile run times were also associated with higher injury risk.

g. Associated with a higher incidence of self reported duty-related injury (from questionnaire) were female gender, race, shoe problems, uniform problems, high or low weekly aerobic activity (bimodal relationship), high or low weekly strength training (bimodal relationship), lower self-rated physical activity, and less satisfaction with medical care, more time spent standing, not feeling relaxed during performances, deliberately trying to relax during performances, longer duration of playing musical instrument, longer duration of marching (instrumentalists only), more frequent singing and dancing (vocalists only), and vocalists who also danced. For men only, fewer push-ups, fewer sit-ups, and slower 2-mile run times were also associated with duty-related injury risk.

h. Associated with a higher incidence of musculoskeletal symptoms (from questionnaire) were female gender, unit, age, educational status, shoe problems, uniform problems, less frequent sports activity, lower self-rated physical activity, less satisfaction with medical care, few or many years playing the primary musical instrument (bimodal relationship), playing a second musical instrument, longer marching duration, more time spent standing, not feeling relaxed while performing, and deliberately trying to relax while performing.

i. Observations of Band activities included two set-ups by the band support group (indoor and outdoor venues), two full honors funerals, a twilight tattoo, a major concert, a herald trumpets rehearsal, and a Memorial Day wreath laying at the Tomb of the Unknown Soldiers.

4. DISCUSSION. When compared to the entire Army the injury visit rate of male Band members (visits/100 person-years) was 16% lower in 2004 and 12% lower in 2005. Compared to the Army-wide injury visit rate, the female Band injury visit rate was 23% lower in 2004 and 36% lower in 2005. Injury visit rates were also lower for the Band compared to those in the Army who were over age 30. Although the injury visit rate was lower than for the Army in general, the annual cumulative injury incidence was still relatively high and comparable to officers at the Army War College who are of similar age. In addition to quantifying the injury visit rate and annual injury incidence, a number of risk factors associated with injuries were identified. The risk factors differed somewhat depending on the outcome measure but injury risk factors that were in agreement across two or more outcome measures were female gender, low physical activity, low physical fitness, prior injuries, unit, functional group, not feeling relaxed during performances, deliberately trying to relax during performances, and complaints of shoe and uniform problems. A partial explanation for the association between current injuries and prior injury is that 57% of the prior injuries appeared to be chronic/recurrent.

5. RECOMMENDATIONS. Recommendations for reducing injuries and symptom prevalence were made on the basis of three criteria, each with a 3-point scale (high, moderate, and low). These criteria were: 1) evidence of a problem (i.e., the amount of collected data indicating that there was a problem), 2) effectiveness of a potential intervention based on previously published studies, and 3) resources (money and time) required by the Band commander to implement the intervention. The Table below provides the criteria and recommendations with their ranking scales.

Summary of Recommendations and Criteria Ratings

Intervention	Evidence of a Problem	Effectiveness of Intervention	Expense of Intervention	Recommendation Level
Increase Physical Activity and Physical Fitness	High	High	Low	High
Provide Ear Protection	High	Moderate	High	Moderate
Conduct Annual Hearing Tests	High	High	Low	High
Reduce Environmental Heat Exposures	Moderate	High	Low	High
Provide Ergonomic Devices to Reduce Instrument Problems	High	Moderate	High	Moderate
Provide Functional Movement and Pain Management Training	Moderate	High	Moderate	Moderate
Reducing Standing/Marching	Moderate	Low	Low	Moderate
Provide Appropriate Shoes	High	Low	High	Low
Provide Uniforms for Hot/Humid Conditions	High	Low	High	Low
Change Chairs	Low	Low	High	Low

6. CONCLUSIONS. The injury visit rate for the US Army Band was lower than that of the entire Army or subsamples of the Army of comparable age. Despite this, the cumulative injury incidence (51%), incidence of duty-related injuries (37%), and prevalence of musculoskeletal symptoms (63%) was relatively high. A number of recommendations were made as a result of data collected from focus group interviews, questionnaire responses, observations on Band activities, and by examining associations between acquired data and injury incidence and musculoskeletal symptoms. The recommendations were graded based on 1) the weight of the evidence that a problem existed, 2) the effectiveness of potential interventions to reduce the problem (judged from previous reports), and 3) the expense of the intervention. Implementing some or all of the suggested interventions is likely to reduce injuries and musculoskeletal symptoms in the US Army Band.

EPIDEMIOLOGICAL CONSULTATION REPORT NUMBER 12-HF-01Q2A-06
INJURIES AND INJURY PREVENTION IN THE US ARMY BAND

1. REFERENCES. Appendix A contains the references used in this report.

2. PURPOSE. The purpose of this paper is to present the findings and recommendations of the epidemiological consultations (EPICON) in support of the United States (US) Army Band.

3. AUTHORITY.

a. In January 2006, the US Army Medical Command (USAMEDCOM) received a letter from COL Thomas Rotondi, Leader and Commander of the US Army Band. This letter requested assistance in examining injury rates and in providing suggestions for injury prevention measures. The request letter is at Appendix B.

b. Under Army Regulation 40-5 (1), the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) is responsible for providing epidemiological consultation services upon request.

4. BAND HISTORY AND MISSIONS.

a. The US Army Band was established in 1922 by General John J Pershing. General Pershing had served as the commander of the US Expeditionary Forces in Europe during World War I and had been impressed by the European Army Bands. He believed that Bands were important for troop morale and efficiency and desired a band that would equal or surpass those he had seen in Europe during the war. The Band in its early years (1922-1942) was involved in regular radio broadcasts, baseball World Series events, presidential inaugurations, and performed at the first presidential wreath laying at the Tomb of the Unknown Soldier in 1927. From June 1943 to June 1945 (WWII) the Band served overseas in France, Belgium, Germany, Morocco, Tunisia, and England. One member of the Band received the Purple Heart when the Band experienced a German V-2 rocket attack in Antwerp, Belgium. While the Band was stationed overseas the "Auxiliary Band" was established to fulfill diplomatic and ceremonial band requirements in Washington DC; this unit later became the US Army Ceremonial Band. After World War II and into the 1980's the Band was expanded to include the US Army Strings, the US Army Chorus, the US Army Blues Jazz Ensemble, the US Army Herald Trumpets, and the US Army Chorale. In 2002, a contingent of the Band performed in Kuwait, Afghanistan and

Uzbekistan, the first time the Band had performed in a foreign combat theater since World War II. Today's Band missions are highly varied and include indoor and outdoor concert venues, retirement ceremonies, head-of-state arrivals at the White House, presidential inaugurations, full honors funerals at Arlington National Cemetery, memorial services, and regular wreath layings at the Tomb of the Unknowns (2).

b. In 2006, the Band had 7 separate units. The Blues Jazz Ensemble performed jazz music, an original American art form, as well as popular pieces. The Ceremonial Band supported over 700 military funerals each year at Arlington National Cemetery. The Ceremonial Band unit also supported wreath laying ceremonies at the Tomb of the Unknowns, retirement ceremonies, special review ceremonies, and arrival and departure honors for foreign dignitaries at the White House. The Chorale unit performed popular and patriotic music and often dances in addition to their singing. The Chorus unit is the only all male professional chorus in the United States. The Chorus unit repertoire included popular, Broadway, folk, and classical music. The unit often performed at the White House and in support of functions hosted by the State Department and the Department of Defense. The Concert Band performed primarily in concert halls but in the summer months the unit also performed outdoor concerts on the West steps of the US Capital and in various venues in the Washington DC area. The Strings performed a wide variety of string music and serve as "strolling strings" (walk among guests while playing their instruments) in support of activities at the White House, State Department, Supreme Court, Department of Defense and other cabinet level functions. The Support unit assisted the other Band units with staging, audio/lighting, library functions, supply, production, administration, operations, information management, and transportation.

5. REVIEW OF LITERATURE.

a. The US Army Band is composed of vocalists, support staff, conductors, and instrumentalists. A review of the literature was conducted for each of these 4 groups using PubMed (MEDLINE), Cumulative Index to Nursing and Allied Health Literature (CINAHL), Academic Search Premier, Biomedical Reference Collection (Comprehensive), and the Defense Technical Information Center (DTIC). The reference lists of articles found in this search were also examined. For vocalists, keywords included vocalists, singers, chorale, and chorus with injury and musculoskeletal. For conductors, keywords included conductors, conducting, and music director with injury and musculoskeletal. For the support staff, emphasis was placed on the staging and audio/lighting crews because in preliminary analysis were found to be the support subgroup most susceptible to injury. Keywords for the support group included staging, set-up, stage crew, and stage workers with injury and musculoskeletal. For instrumentalists, keywords included musicians, instrumentalists, strings, brass, jazz, winds, and woodwinds with injury and musculoskeletal.

b. Very little literature was found on injuries among vocalists. The few articles obtained focused on general medical problems (3, 4), although two articles (5, 6) did include some information on musculoskeletal symptoms. No studies were found on injuries or musculoskeletal symptoms among stage crews or conductors.

c. The literature on injuries among instrumentalists was extensive with most investigations published in the last 25 years. In a review of medical problems of instrumental musicians published in 1982, Harman (7) noted that he could not find a single article on the prevalence of medical problems in musicians. However, a search of the historic literature revealed a case series reporting on medical problems in 21 patients published in 1887 (8). The first of the modern epidemiological studies was published in 1986 by Caldron et al. (9) who administered a questionnaire to non-wind instrument musicians in the northwestern Ohio area. Shortly after the Caldron (9) article was published, and with the initiation of the journal "Medical Problems of Performing Artists", the literature proliferated.

(1) Prevalence and Incidence of Musculoskeletal Problems in Musicians

(a) Table 1 shows a summary of studies reporting on the prevalence of musculoskeletal disorders in musicians. Most of these studies involved self-reports of symptoms from questionnaire data. Exceptions are surveys by Fry (10, 11), Sadeghi et al. (12), and Blum and Ahlers (13) which entailed unstructured interviews and/or physical examinations. Response rates to the various surveys (where reported) ranged from 23% to 100%. Musicians surveyed included professionals (10, 13-19), students (6, 11, 12, 20-26), amateurs (27), and mixes of these groups (9, 28-30). One study involved a marching band that, in addition to musicians, included color guards, banner carriers, and flag carriers (31).

(b) Table 1 shows that case definitions varied widely. Most studies addressed pain or musculoskeletal problems during playing (6, 9-11, 14, 16, 17, 20, 23, 25-28, 31) but in some cases appear to query any musculoskeletal pain (playing or otherwise) (12, 13, 15, 18, 21, 24, 29). Two studies not included in Table 1 (32, 33) dealt with general medical problems and the prevalence of musculoskeletal problems could not be determined from the data presented.

(c) In Table 1, the prevalence of pain and musculoskeletal symptoms ranges from 9% to 94%. The wide disparity may be due to differences in the wording of questionnaires, types of instruments played, gender distribution, amount of daily practice on the instrument, type of musician (professional, student, amateur, mixed groups), and the type of prevalence examined (lifetime vs. point prevalence). If only professional musicians are considered (10, 15-18), average±SD prevalence is 63±11%; if only students are considered (5, 6, 11, 12, 20-25, 34-37), average±SD prevalence is 56±26%. Lifetime prevalence studies (5, 6, 9, 13-15, 23, 25-27, 34-38) indicate 62±22% of musicians experience symptoms, while point prevalence studies (10-12, 16-18, 20-22, 24, 28, 29, 39) indicate 52±18% (current symptoms to symptoms in the last year).

Fry (11) reported the lowest playing-related prevalence rates when he personally interviewed students at 11 music institutions at various times during the year. He found prevalence at the institutions ranged from 5% to 21% (only the average is reported in Table 1). One systematic review (40) of prevalence included only studies 1) with classically trained musicians, 2) with an outcome measure that involved playing-related musculoskeletal disorders and 3) involving a response rate of 60% or higher. This review found prevalence ranged from 39% to 87%.

(d) There are several problems with the prevalence studies in Table 1. In many studies, response rates are low suggesting that samples may not be representative of the groups surveyed. Case definitions vary widely ranging from mild pain and discomfort to injury restricting playing, as noted above. It has been suggested that many musicians may be reluctant to disclose problems because of how it might affect their careers (11) and this may result in under-reporting of the actual prevalence. These factors call for caution in interpreting these data and in comparing prevalence across studies.

Table 1. Studies on the Prevalence of Musculoskeletal Disorders in Musicians

Study (Reference Number)	Response Rate (% participating)	Sample Participating	Case Definition	Proportion of Sample with Complaints (%)
Caldron et al, 1986 (9)	30	250 non-wind musicians (58% students, 30% professional, 11% teachers, 1% amateur)	Music-related musculoskeletal problems[a]	59
Fry 1986 (10)	Not Reported	485 professional orchestra members (Australian, American, English); 340 men, 145 women	Painful overuse syndromes on playing[a]	64
Fry 1987 (11)	Not Reported	Students in 11 Australian music schools; 562 men, 687 women	Overuse syndromes[a]	9
Hiner et al. 1987 (14)	53	27 premier violinists agreeing to participate in only major violin competition in Western Hemisphere	Musculoskeletal problem related to playing the violin[c]	52[d]

Study (Reference Number)	Response Rate (% participating)	Sample Participating	Case Definition	Proportion of Sample with Complaints (%)
Fry et al. 1988 (34)	100	49 high-school boys (aged 14-18 yrs) and 49 high school girls (aged 13-18 yrs)	1. Pain with playing, currently or in past 2. Current persistent pain	1. 56[d] 2. 34[d]
Lockwood et al. 1988 (20)	100	120 secondary school musicians	Playing-related pain	51[d]
Middlestadt et al (15)	55	1378 string players in symphony and opera	Musculoskeletal problems	58
Grieco et al. 1989 (21)	75	117 piano students (aged 8-19 yrs, 54 boys, 63 girls)	Musculoskeletal complaints[a]	62
Revak 1989 (25)	31	71 graduate and undergraduate piano students at 7 music schools in Philadelphia (23 men, 48 women)	Physical discomfort in hands or arms that persisted or recurred for more than 1 week and impaired ability to practice the piano	42
Newmark and Salmon 1990 (27)	29	48 members of a musical cooperative, 43 non-professionals, 5 professionals (34 men, 14 women)	Some past physical complaints related to playing instrument	44
Zaza 1992 (35)	100	300 Canadian university music students (153 men, 147 women)	Current and past playing-related physical problem that resulted in cessation of playing	43
Pratt et al. 1992 (6)	Not Reported	246 university music students (69 men, 177 women)	Pain associated with playing instrument or singing[e]	87

Study (Reference Number)	Response Rate (% participating)	Sample Participating	Case Definition	Proportion of Sample with Complaints (%)
Larsson et al. 1993 (5)	98	660 students and faculty at Eastman School of Music (New York) (360 men, 300 women, ages 14-68 years)	Musculoskeletal problems during playing (pain, weakness, muscle spasms, numbness, etc.)	67
Harman 1993 (31)	88	110 members of Baltimore Colts Marching Band (64 musicians [47 men, 19 women], 20 flagline [all women], 13 color guard/banner carriers, 4 equipment/ground crew)	Pain or stiffness caused by or aggravated by band practice	Mus[b] Flag[b] Upper Extremity 65 36 Lower Extremity 35 22 Lumbar 41 20 Cervical 5 0
Roach et al. 1994 (24)	100	90 university student instrumentalists who played their instrument at least 7 hr/wk; 94% were music majors (49 men, 41 women)	Joint pain at any site for at least 2 days in last 4 weeks	68
Blum and Ahlers 1994 (13)	Not Reported	331 violists	Current and past musculoskeletal complaints[a]	89[d]
Zaza and Farewell 1997 (28)	59	281 individuals, professional orchestra musicians, music teachers, and post-secondary music students	1. First case of playing-related musculoskeletal disorder 2. Current playing-related musculoskeletal disorders	1. 33 2. 39

Study (Reference Number)	Response Rate (% participating)	Sample Participating	Case Definition	Proportion of Sample with Complaints (%)
DeSmet et al., 1998 (19)	Not Reported	66 young high level pianists	Musculoskeletal overuse pain[a]	43
Zetterberg et al. 1998 (22)	97	227 university music students (120 men, 115 women)	Pain complaints in 9 body areas attributed to musical activity	51
Fjellman-Wiklund and Sundelin 1998 (18)	98	36 Swedish music teachers	Pain and aches during the preceding 12 months	80
Blackie et al 1999 (36)	64	16 university piano students (12 women, 4 men)	Injury restricting practice	94
Yeung et al. 1999 (16)	23	39 professional musicians in Hong Kong	Playing-related musculoskeletal complaints in last 12 months	64
Morse et al. 2000 (29)	36	209 respondents (111 men, 98 women) to a random digit dialing survey who said they played a musical instrument (954 complete interviews total)	Pain in neck, shoulder, arm, or hands that lasted 5 straight days or 20 days altogether in last year	29
Shields and Dockrell 2000 (23)	87	159 undergraduate university piano students in Ireland (127 women; 32 men)	"…problem caused by playing the piano that prevented piano playing for a period of 48 hours or longer"	26
Pak and Chesky 2001 (39)	Not Reported	455 self-identified piano or keyboard players from internet survey (205 men, 243 women)	Upper extremity musculoskeletal problems[a]	59

Study (Reference Number)	Response Rate (% participating)	Sample Participating	Case Definition	Proportion of Sample with Complaints (%)
Ordonez et al. 2002 (30)	Not Reported	341 pianists, professionals and students (150 men, 191 women)	Repetitive strain injury or cumulative trauma disorder[a]	65
Yee et al. 2002 (26)	100	33 female undergraduate and graduate female piano students	History of musculoskeletal symptoms related to piano playing (recurrent or ongoing)	91
Chesky et al. 2002 (37)	Not Reported	739 university brass instrument players (560 men, 179 women)	Present and previous musculoskeletal problems	61
Davies and Mangion 2002 (17)	45	240 permanently employed and free-lance musicians, classical and non-classical	Playing-related musculoskeletal pain and symptoms	50
Ackerman and Adams 2003 (38)	Not Applicable	32 university music students (graduates and undergraduates) and professional orchestral players (9 men, 23 women)	Playing-related pain	88
Sadeghi et al. 2004 (12)	Not Reported	78 first year daf and setar students (31 men, 47 women)	Positive physical exam of the upper limbs and neck for pain, paresthesia, sensory changes and other pain or symptoms related to cumulative trauma disorders	53

[a]Not well defined or actually lacks specific case definition
[b]Mus=Musicians; Flag=Flagline
[c]Did not include "knots" or "skin infection" reported in article's Table 1
[d]Calculated from data in article.
[e]Some vocalists were included

(e) Three studies (41-43) have reported on music-related upper extremity musculoskeletal injury incidence rates among music school students. All three studies involved students in a pre-paid university health plan at the same university. A retrospective review of the medical records was used to determine the number of cases; denominators were obtained from the university student registration database. The overall injury incidence rate was 8.5, 8.5, and 8.3 injuries/100 student-years in the 3 investigations. There was overlap in the reported years with one study reporting from 1982-1986 (42), another from 1986-1989 (43), and another from 1982-1996 (41).

(f) One investigation (24) compared joint pain prevalence among student instrumentalists and non-instrumentalists at a large university. Instrumentalists were a convenience sample of 90 student musicians, (94% music students) who reported playing an average of 7 hours/week or more. Non-instrumentalists were 159 students who did not play an instrument. Students were asked on a questionnaire if they had joint pain for at least 2 days in the last 4 weeks. Questionnaire return rate was 99.6%. Of the instrumentalists, 67% reported pain while 65% of the non-instrumentalists reported pain. Compared to non-instrumentalists, the instrumentalist's odds of pain in the upper body were twice as great but in the lower body only half as great.

(g) Two studies examined musculoskeletal symptoms in vocalists. In one study (5), a 53-item questionnaire was administered to 660 students at the Eastman School of Music (98% questionnaire return rate). Fifty-one percent of vocalists reported musculoskeletal symptoms compared to 60% to 77% of the instrumentalists (there were several instrumental groups). Another investigation (6) also examined vocalists but only compared symptoms by anatomic location. They reported that vocalists experienced more throat problems, 57% compared to 0 to 18% for other instrumental groups.

(h) Much of the pain and discomfort experienced by musicians may be due to repetitive motions when playing instruments. Another possible factor is the body postures that must be adopted for some instruments. For example, violinists have very awkward body postures with both arms elevated above 30^{o} while playing the instrument. One study recorded that during an 8-hour day, violin teachers had their right and left arms elevated above 30^{o} for 23% and 12% of the time. For the right and left arm this was about 2 hours and 1 hour, respectively.

(2) Amount of Time on Instrument. An important factor in the development of musculoskeletal symptoms may be the amount of time musicians play their instruments. Table 2 summarizes studies reporting on this factor. Non-elite secondary school students (34), amateur setar and daf students (12), and recreational (non-professional) musicians (27, 29, 31) reported practicing an average of about 6 to 8 hours per week. Students in elite music-orientated secondary schools reported an average playing about 19 to 22 hours per week (20, 21). University music students reported average playing times ranging from 13 to 23 hours per week

(22, 24, 35-37, 44). The only study querying playing time in professional musicians (Hong Kong orchestral musicians) found they reported an average playing time of 21 hours per week (16).

Table 2. Studies Reporting Time on Instrument

Study (Reference Number)	Response Rate (% participating)	Sample	Average Amount of Playing Time[a]	Range of Playing Times[a]
Caldron et al, 1986 (9)	30	250 non-wind musicians (58% students, 30% professional, 11% teachers, 1% amateur)	25 hr/wk	Not Reported
Hiner et al. 1987 (14)	53	27 premier violinists agreeing to participate in only major violin competition in Western Hemisphere	4.8 hr/day (24.0 hrs/wk)	2-7 hr/day (10-35 hr/wk)
Fry et al. 1988 (34)	100	49 high-school boys (aged 14-18 yrs) and 49 high school girls (aged 13-18 yrs)	1.2 hr/day (6.0 hr/wk)[b]	Not Reported
Lockwood et al. 1988 (20)	100	120 secondary school musicians (admitted to school by competitive audition)	19.0 hr/wk	5-42 hr/wk
Grieco et al. 1989 (21)	75	117 piano students (aged 8-19 yrs, 54 boys, 63 girls) (Milan Conservatory)	22.3 hr/wk	Not Reported
Newmark and Salmon 1990 (27)	29	48 members of a musical cooperative, non-professionals	7.1 hr/wk	0-27 hr/wk
Zaza 1992 (35)	100	300 Canadian university music students (153 men, 147 women)	2.6 hr/day (13.0 hr/wk)	0-6 hrs/day (0-30.0 hr/wk)
Harman 1993 (31)	88	110 members of Baltimore Colts Marching Band (64 musicians [47 men, 19 women], 20 flagline [all women], 13 color guard/banner carriers, 4 equipment/ground crew)	6.5 hr/wk	Nor Reported
Roach et al. 1994 (24)	100	90 university student instrumentalists who played their instrument at least 7 hr/wk; 94% were music majors	22.5 hr/wk	Not Reported
Manchester and Park 1996 (44)	45	96 music students at a large university	5.1 hr/day[b] (25.5 hr/wk)	Not Reported

Study (Reference Number)	Response Rate (% participating)	Sample	Average Amount of Playing Time[a]	Range of Playing Times[a]
DeSmet et al., 1998 (19)	Not reported	66 young high level pianists	3.3 hr/day (16.5 hrs/wk)	Not Reported
Zetterberg et al. 1998 (22)	97	227 university music students (120 men, 115 women)	2.8 hr/day (14.0 hr/wk)	0.25-9.0 hr/day (1.3-45.0 hr/wk)
Blackie et al 1999 (36)	64	16 university piano students (12 women, 4 men)	12 .1 hr/wk[b]	Not Reported
Yeung et al. 1999 (16)	23	39 professional musicians in Hong Kong	21.4 hr/wk[b]	Not Reported
Morse et al. 2000 (29)	36	209 respondents (111 men, 98 women) to a random digit dialing survey who said they played a musical instrument (954 complete interviews total)	5.6 hr/wk[a]	Not Reported
Chesky 2002 (37)	Not Reported	739 university brass instrumentalists	2.5 hr/day (12.5 hr/wk)	Not Reported
Ackerman and Adams 2003 (38)	Not Reported	32 university music students (graduates and undergraduates) and professional orchestral players (9 men, 23 women)	3.5 hr/day (17.5 hr/wk)	1 to 6 hr/day (5-30.0 hrs/wk)
Ackerman and Adams 2004 (45)	100	28 highly skilled violinists and violists, professionals and university music students (21 women, 7 men)	3 hr/day (15.0 hrs/wk)	1.5-6hr/day (7.5-30.0 hrs/wk)
Sadeghi et al. 2004 (12)	Not Reported	78 first year daf and setar students (31 men, 47 women)	1.5-1.6 hr/day (7.5-8.0 hrs/wk)	Not Reported

[a]The first number is the units provided in the article; the second number (if present) converts this to hr/wk assuming 5 days/wk playing
[b]Calculated or estimated from available data in article

(3) Anatomical Locations of Musculoskeletal Symptoms.

(a) The anatomical location of most playing-related musculoskeletal symptoms in musicians is the upper body. Instrumentalists generally report symptoms at multiple sites and the sites examined in different studies differ in terms of their groupings. Most studies report the fingers, hands and wrist as the region with the highest symptom prevalence ranging from 13% to 63% of those sampled (5, 9-12, 19, 23, 25, 36, 39, 46). Other affected areas include the neck, shoulders, arms and back (5, 9-11, 14, 15, 18, 23, 25, 36, 38). Studies that include the lower body find that only 2-9% of musicians report symptoms in this area (5, 9, 15, 18, 38). When student instrumentalists were compared to a general student population at a major American

university, instrumentalists had twice the odds of reporting joint pain in the upper body in the preceding 4 weeks (OR (instrumentalists/non-instrumentalists=2.0, 95%CI=1.2-3.4), but half the odds of reporting lower body joint pain in the preceding 4 weeks (OR (instrumentalists/non-instrumentalists)=0.5, 95%CI=0.3-0.9) (24).

(b) Studies cited above involve students, teachers, or professional musicians who are likely to be seated most of the time. One study (31) involving the Baltimore Colts marching band (mean age 25 years) found that the proportion of musicians reporting musculoskeletal symptoms (primarily pain and stiffness) in the upper extremities, lower extremities, and lumbar region was 36%, 22%, and 41%, respectively.

(4) Risk Factors for Musculoskeletal Symptoms and Injuries among Musicians. Table 3 lists hypothetical risk factors for musculoskeletal problems that have been suggested in the literature by a number of authors (17, 47-51). Intrinsic risk factors are those that are part of the individual (e.g., gender, age, physical fitness) while extrinsic risk factors are those that are part of the external environment (e.g., practice time, instrument played, seating, weather). Ackerman and Adams (45) administered a questionnaire to 26 violinists and viola players currently suffering from performance-related musculoskeletal symptoms. The questionnaire had a list of potential risk factors for musculoskeletal symptoms (developed from the literature) and the musicians were asked to rank the risk factors. An open-ended question allowed them to add factors. Seven medical personnel who had been working with musicians for over 10 years were also asked to perform the same rankings. Results are shown in Table 4. The Spearman rho correlation between the musicians' and health providers' ratings was 0.75 (secondary data analysis). Both groups considered the first 5 items listed in the table as the predominate contributors to symptoms.

Table 3. Hypothetical Risk Factors for Musculoskeletal Symptoms and Injuries among Musicians Reported in the Performing Arts Literature

Intrinsic	Extrinsic
Gender	Instrumental group (strings, keyboard, winds, etc.)
Lack of Hypermobility	Amount of daily practice/performance
Lack of Strength	Sudden increase in practice time
Lack of Flexibility	Size and shape of instrument
Small Size	Change in technique
Anatomic variations	Change in teacher
Performing/playing level	Excessive repetition of a piece
Playing style/technique	Difficult piece
Lack of warm-up	Change in repertoire
Playing posture	Chairs
Excessive muscle tension	Lack of playing breaks
Stress/anxiety	Cramped playing conditions
Insufficient recovery time	Lack of practice

Table 4. Musician and Health Care Professional Ranking of Factors Contributing to Performance-Related Musculoskeletal Disorders

Potential Risk Factor	Musicians Rankings	Health Professionals Rankings
Long hours of practice	1	4
Sudden increase in playing time	2	2
Poor posture	3	1
Technique flaws	4	5
Insufficient rest breaks	5	3
Lack of understanding of physical strain	6	9
Insufficient warm-up	7	7
Inadequate chairs	8	10
Travel strains	9	13
Performance anxiety	10	11
Poor physical condition/fitness	11	6
Inadequate instrument set-up	12	8
Poor flexibility	13	12
Cold environments[a]		
Difficult programs[a]		
Highly repetitive studies[a]		
Excessive muscle tension[a]		
Long orchestra rehearsals[a]		

[a]Additional risk factor listed by musicians

(a) Gender.

i. Gender is perhaps the most frequently studied risk factor for musculoskeletal symptoms and injuries among musicians. Table 5 shows studies that have examined the association between gender and musculoskeletal symptoms. In all studies, women were at higher risk of reporting symptoms than men. The data in Table 5 were applied to a meta-analysis technique that employs a general variance-based method using confidence intervals (52). When all studies were considered in the meta-analysis, the relative risk of musculoskeletal symptoms in women was 1.26 (95%CI=1.21-1.32) times greater than that of men. Note that the studies by Fry (34) and by Pak and Chesky (39) were considered twice in this meta-analysis, once for each injury definition in Table 5.

Table 5. Summary of Studies on Association between Gender and Prevalence of Musculoskeletal Problems

Study (Reference Number)	Response Rate (% participating)	Sample	Outcome Definition	Prevalence (Women/ Men) (%)	Risk Ratio (Women/ Men)	95% Confidence Interval
Fry 1986 (10)	Not Reported	485 professional orchestra members (Australian, American, England)	Painful overuse syndromes on playing	67/63	1.06[b]	0.92-1.22[b]
Fry 1987 (11)	Not Reported	Students in 11 Australian music schools; 562 men, 687 women	Overuse syndromes	11/7	1.55[b]	1.08-2.24[b]
Fry et al. 1988 (34)	100	49 high-school boys (aged 14-18 yrs) and 49 high school girls (aged 13-18 yrs)	1. Pain with playing 2. Persistent pain	1. 63/49 2. 53/14	1. 1.29 2. 3.71	1. 0.90-1.85 2. 1.78-7.70
Lockwood et al. 1988 (20)	100	120 secondary school musicians	Instrument-related pain	68/47	1.46[b]	1.05-2.01[b]
Middlestadt et al (15)	55	1378 string players in symphony and opera	Musculoskeletal problems	70/52	1.35[b]	1.23-1.46[b]
Pratt et al. 1992 (6)	Not Reported	246 university music students (177 women, 69 men)	Pain associated with playing instrument or singing	87/87	1.01[b]	0.90-1.13[b]
Larsson et al. 1993 (5)	98	660 students and faculty at Eastman School of Music (New York) (360 men, 300 women, ages 14-68)	Musculoskeletal problems during playing (pain, weakness, muscle spasms, numbness, etc.)	76/59	1.29[b]	1.16-1.44[b]
Roach et al. 1994 (24)	100	90 student instrumentalists who played their instrument at least 7 hr/wk; 94% were music majors	Joint pain at any site for at least 2 days in last 4 weeks	74/61	1.22[b]	0.91-1.62[b]
DeSmet et al. 1998 (19)	Not Reported	66 young, high level pianists	Overuse musculoskeletal problems	49/36	1.33[b]	0.71-2.55[b]
Zetterberg et al. 1998 (22)	97	227 university music students (120 men, 115 women)	Pain complaints in 9 body areas attributed to musical activity	50/40	1.26[b]	0.94-1.68[b]
Yeung et al. 1999 (16)	23	39 professional musicians in Hong Kong	Playing-related musculoskeletal complaints in last 12 months	67/64	1.05[b]	0.62-1.80[b]
Shields and Dockrell 2000 (23)	87	159 undergraduate university piano students in Ireland (127 women; 32 men)	Injury defined as a problem caused by playing the piano that prevented piano playing for a period of 48 hours or longer"	26/25	1.04	0.53-2.30
Pak and Chesky 2001 (39)	Not reported	455 self-identified piano or keyboard players from internet survey (205 men, 243 women, 7 no reported gender)	1. Any upper extremity musculoskeletal problem[a] 2. Severe upper extremity musculoskeletal problem[a]	1. 66/51 2. 34/24	1. 1.31 2. 1.40	1. 1.11-1.54 2. 1.03-1.92
Ordonez et al. 2002 (30)	Not reported	341 pianists, professionals and students (150 men, 191 women)	Repetitive strain injury or cumulative trauma disorder[a]	79/47	1.67	1.40-1.99
Sadeghi et al. 2004 (12)	Not reported	78 first year daf and setar students (31 men, 47 women)	Positive physical exam of the upper limbs and neck for pain, paraesthesia, sensory changes and other pain or symptoms related to cumulative trauma disorders	60/42	1.42	0.88-2.29

[a]Lacks specific definition
[b]Calculated from available data in article

ii. Three related studies examined the association between gender and the incidence of upper extremity musculoskeletal injuries. All of these studies were conducted with the same population of music students reporting to the same university health clinic. A retrospective review of the medical records was used to determine the number of cases; denominators were obtained from the university student registration database. In the first study (42), the 4-year upper extremity injury incidence rate was 5.7/100 person-years for men and 11.5/100 person-years for women (risk ratio (women/men)=2.04, 95% CI=1.45-2.85). In a follow-up study (43) that tracked three more years, it was reported that male rates ranged from 4.9 to 7.2 injuries/100 person-years while the female rates ranged from 9.5 to 12.1 injuries/100 person-years (overall rates were not provided). The third study covered a 10-year period and authors reported that upper extremity injury rates were 5.9/100 person-years for men and 8.9/100 person-years for women (risk ratio=1.50 (95%CI=1.21-1.86)).

iii. Two multivariate studies were conducted examining gender (not cited in Table 5 because risk ratios were not reported and could not be calculated from the data they presented). One study (35) found that women had 2.0 (95% confidence interval = 1.0-3.9) times higher odds of injury compared to men in a multivariate analysis that included gender, warm-up, breaks, age, instrumental group, and daily practice time. Another investigation (17) found that women were more at risk of pain and musculoskeletal symptoms over the previous year than men but only if they played a stringed instrument. The third study (28) showed that women were at greater risk of a current or past playing-related musculoskeletal disorder in both univariate and multivariate analysis even when string instrument playing was controlled for in the analysis. Differences between the latter 2 studies may be due to wording of the questionnaires used to obtain the injury outcome variables.

iv. Few studies examining gender differences have speculated on why women have higher symptom prevalence than men. Roach et al. (24) noted that women have less upper body strength, possibly leading to more rapid fatigue and discomfort. Related to this is the fact that women have less fat-free mass (53) but still must play the same instrument in the same playing position as men. Long or more frequent playing sessions with highly repetitive musculoskeletal movements may be more likely to fatigue and possibly injure the smaller female muscle fiber mass used to play the instrument. Fatigue could also result in the recruitment of ancillary muscle fibers not typically used for playing. This could place unaccustomed stress on these fibers and other body tissues resulting in pain, discomfort, or injury. This may be especially true if the instrument is heavy, involves difficult playing positions (e.g., cello with arms extended), or involves many complex movements of the smaller muscles of the finger, hand or wrist. Table 6 shows the comparative muscle mass of the reference man and reference woman.

Table 6. Comparative Muscle Mass of Reference Man and Reference Women (From Reference 53)

	Reference Man	Reference Woman	Ratio (Man/Woman)
Muscle Mass (kg)	31.3	20.4	1.53
Proportion of Total Body Mass (%)	44.8	36.0	1.24

(b) Instrumental Group.

i. Instrumental group is the second most investigated risk factor for musculoskeletal symptoms or injury. "Instrumental group" involves a broad classification of musical instruments into various categories: string (e.g., violin, guitar), keyboard (e.g., piano, accordion), wind (e.g., clarinet, flute), percussion (e.g., drums, xylophone), and brass (e.g., tuba, trumpet). Table 7 shows studies examining associations between instrumental groups and prevalence or incidence of musculoskeletal symptoms or injuries. In some studies, particular instrumental groups were not included and these are blank cells in Table 7. Three studies examined injury incidence (41-43) while the other studies in the table examined symptom prevalence. The table ranks the instrumental groups from the highest (number 1) to the lowest prevalence/incidence in each study. At the bottom of the table is the mean and SD of the rankings for the instrumental groups where 1) all studies are considered, 2) only symptoms prevalence studies are included (5, 10, 11, 15, 20, 29) or 3) only injury incidence studies are included (41-43). Regardless of how the studies are grouped, string and keyboard players appear to have the highest symptom prevalence/injury incidence and brass players have the lowest (5, 10, 11, 15, 20, 22, 29, 41, 42). Data on vocalists is conflicting with one study placing them at the lowest risk (5) while another places them at higher risk (35). One study (20) found that large string instruments (e.g. cello, double bass) had higher symptom risk than smaller string instruments (e.g., violin, viola) among secondary school student-musicians; however, another study found no difference in symptoms among large and small string players in a symphony orchestra (15).

ii. The higher rate of musculoskeletal symptoms for string musicians is substantiated in two multivariate studies. Zaza and Farewell (28) found string players were at higher risk of current and past musculoskeletal symptoms in both univariate and multivariate analysis. In multivariate analysis, Davis and Mangion (17) found that string players had elevated risk of musculoskeletal symptoms over a playing lifetime and more severe symptoms. An interaction was also noted for symptom severity indicating that only female string players were at higher risk.

Table 7. Ranking of Symptom Prevalence or Injury Incidence by Instrumental Group

Study (Reference Number)	Sample	Outcome Definition	Ranking (lower number is higher ranking)					
			Strings	Keyboard	Winds	Percussion	Brass	Voice
Fry 1986 (10) [a]	485 professional orchestra members; 340 men, 145 women (Australian, American, English)	Painful overuse syndromes on playing	1	4	2		3	
Fry 1987 (11) [a]	Students in 11 Australian music schools; 562 men, 687 women	Overuse syndromes	4	2	1	3	5	
Manchester 1988 (42)	132 full-time students at a university music school; 44 men, 88 women	Performance–related upper extremity injuries in a student health service	2	1	3			
Lockwood et al. 1988 (20)[a]	120 secondary school musicians	Instrument-related pain	3		2	4	1	
Middlestadt et al (15)	1378 string players in symphony and opera	Musculoskeletal problems	1		2		3	
Zaza 1992 (35)	300 Canadian university music students; 153 men, 147 women	Current and past playing-related physical problem that resulted in cessation of playing	3	1	5	6	4	2
Manchester 1991(43)	226 full-time students at a university music school; 82 men, 144 women	Performance–related upper extremity injuries	2	1	3			

Study (Reference) Number)	Sample	Outcome Definition	Ranking (lower number is higher ranking)					
			Strings	Keyboard	Winds	Percussion	Brass	Voice
Larsson et al. 1993 (5)	660 students and faculty at Eastman School of Music (New York) ; 360 men, 300 women, ages 14-68	Musculoskeletal problems during playing (pain, weakness, muscle spasms, numbness, etc.)	1	4	2	3	5	6
Cayea and Manchester 1998 (41) [a]	513 full-time students at a university music school	Performance–related upper extremity injuries	1	2	4	3	5	
Morse et al. 2000 (29)	209 respondents (111 men, 98 women) to a random digit dialing survey who said they played a musical instrument (954 complete interviews total)	Pain in neck, shoulder, arm, or hands that lasted 5 straight days or 20 days altogether in last year	3	2	5	1	4	
Mean±SD (All Studies)			2.1±1.1	2.1±1.3	2.9±1.4	3.3±1.6	3.8±1.4	4.0±2.8
Mean±SD (Symptoms Prevalence Studies)			2.3±1.3	2.6±1.3	2.7±1.6	3.4±1.8	3.6±1.4	4.0±2.8
Mean±SD (Injury Studies)			1.7±0.6	1.3±0.6	3.3±0.6	3.0 [b]	5.0 [b]	4.0±2.8

[a] Calculated from data available in article

[b] Based on 1 study (41)

iii. Several hypotheses have been advanced for why string players appear to have more playing-related musculoskeletal disorders and injuries. Many string players tend to play in awkward postures (28) which involve asymmetric loading on the body. For some instruments like the violin and viola there are requirements to hold the upper arms in shoulder abduction for extended times. Long periods of shoulder abduction have been shown to increase the incidence of discomfort and musculoskeletal problems (54-56). In addition, it has been reported that string players tend to start at an earlier age than other instrumentalists and require more time to master the instrument. This long exposure time may contribute to longer-term problems (17). String players tend to play more notes during performances, require more movements on their instruments (10, 49), and tend to practice longer (35) than players of other instruments.

(c) Other Risk Factors for Injuries and Musculoskeletal Symptoms

i. Studies that have examined other risk factors for musculoskeletal symptoms or injuries are few so it is best to review each investigation individually, then summarize the general findings. Findings related to gender and instrument are discussed only peripherally in this section since they are discussed in detail above.

ii. Zaza (35) administered a questionnaire to 300 music students at a Canadian university (100% response rate). Students were asked if they had playing-related health problems (PRHP) that caused them to stop playing for longer than 1 week. In multivariate analysis (no univariate results were reported) female gender, performing a warm-up before playing, taking practice breaks, and instrumental group were independent risk factors for PRHP, but age, number of years playing the instrument, and daily practice time were not.

iii. Manchester and Park (44) performed a case-control investigation involving a questionnaire administered to students at an American music university. Cases were music students who had reported to the student health clinic for a playing-related upper extremity injury; controls were music students who had not reported to the health clinic. Matching was on the basis of gender, instrument and academic year. Investigators found that cases spent more hours practicing in the freshman year (5.5 hrs/day vs. 4.7 hrs/day, $p=0.03$), took more frequent playing breaks in their senior year (2.7 breaks/hr vs. 1.3 breaks/hr, $p=0.04$), and were more likely to have taken lessons on Alexander or Feldenkrais technique (67% vs. 27%, $p<0.01$). Cases did not differ from controls on age, height, weight, hand span, years playing their instrument, regular aerobic exercise, regular strength exercise, hypermobility, whether or not they took a non-music job, and whether or not they were in a summer music program.

iv. Yeung et al. (16) mailed out a questionnaire to 170 professional orchestral musicians in Hong Kong; 39 musicians returned the surveys (23% response rate). Musicians were asked to report on playing-related musculoskeletal complaints (PRMC) defined as pain, weakness, numbness, tingling or other symptoms from playing that interfere with the ability to play the

instrument at the level to which they were accustomed. In univariate analysis, those with PRMC reported a shorter professional life (8.9 vs. 15.1 years, p=0.04), had pain unrelated to music playing (58% vs. 21%, p=0.02), and performed more hours of practice per week (24 vs. 17 hours, p=0.10). The proportions of musicians with and without PRMC who reported regular exercise were 54% and 64%, respectively (p=0.54). A multivariate logistic regression was performed that included years of professional life, gender, starting age, hours of practice per week, breaks, warm-up before practice, regular exercise and trauma unrelated to playing. Only years of professional life and regular exercise were retained in the multivariate model (procedure for entry into the model not defined).

v. Zetterberg et al. (22) examined the association between hours of practice per day and general pain complaints among university music school students in Goteborg Sweden. Using the Nordic Musculoskeletal Questionnaire (57, 58), general pain complaints were elicited from the 227 students (97% response rate). The 9 body areas were queried including the neck, shoulder, elbow, wrist/hand, thoracic spine, low back, hip, knee, and foot. No univariate results were reported. The authors performed gender-specific multivariate logistic regression that included instrument played, practice time per day, amount of physical exercise, joint hypermobility and other variables. Results indicated that 1) neck pain in men was associated with fewer practice hours, 2) wrist/hand pain in women was associated with more practice hours, 3) knee pain in women was associated with fewer practice hours and more physical exercise, and 4) foot pain in men was associated with more physical exercise.

vi. Morse et al. (29) performed a random digit dialing telephone survey of 6,273 working age US residents. They received replies from 954 of 2,651 eligible participants (36% response rate). Out of this sample, 22% (209/954) reported that they played a musical instrument. If the respondent reported playing a musical instrument they were asked: 1) if they had pain in the neck, shoulder, arm or hands that lasted at least 5 straight days or for 20 days altogether in the past 12 months, and 2) about how many hours per week they played their instrument in an average week. A secondary analysis of their data indicated that those who reported playing their instrument greater than 5 hours per week were more likely to report pain than those reporting 0-4 hours per week of playing (RR=1.59, 95%CI=1.02-2.48, p=0.04).

vii. Roach et al. (24) administered a questionnaire to 90 student instrumentalists at a major American university (100% response rate). The student musicians were asked if they had any joint pain in the last month. Instrumentalists without joint pain had more hours of physical activity (26.0 vs. 17.3 hours/wk, p<0.01) and more hours per week spent walking (2.6 vs. 1.9 hours/wk, p=0.06) than those with joint pain. Instrumentalists with joint pain did not differ from those without joint pain on time practicing with primary instrument (5.9 vs. 6.1 days/wk, p=0.46), daily duration of playing primary instrument (3.1 vs. 3.6 hrs/day, p=0.33), weekly duration of practice with primary instrument (19.3 vs. 22.9 hrs/wk, p=0.20), time spent sitting (6.5 vs. 6.0 hrs/day, p=0.48), time spent standing (3.3 vs. 3.8 hrs/day, p=0.33), time spent

sleeping (6.9 vs. 7.1 hrs/night, 0.49), time spent driving (1.2 vs. 1.1 hrs/day, 0.69), age (24 vs. 22 years, p=0.19), height (67 vs. 67 inches, p=0.98), weight (146 vs. 146 pounds, p=0.94), or BMI (22.8 vs. 22.2 kg/m^2, p=0.47).

viii. Zaza and Farewell (28) performed a case-control investigation. Questionnaires were distributed to 475 classically trained musicians and university music students in Ontario Canada. Usable questionnaires were returned by 281 (59% response rate). Two outcome measures (obtained from the questionnaire) were examined. The first outcome was a first episode of a playing-related musculoskeletal problem (pain, weakness, numbness, tingling, or other symptoms that interfere with playing the instrument at the accustomed level). The second outcome was a history of a playing-related musculoskeletal disorder (PRMD) at any time. Cases were those who reported a problem and controls were those who did not report a problem. Logistic regression results for the first outcome measures are shown in Table 8 and results for the second outcome measure are shown in Table 9. Criteria for entry into the multivariate model were not clear in the article.

Table 8. Univariate and Multivariate Logistic Regression Results with the First Episode of a Playing-Related Musculoskeletal Disorder as the Dependent Variable (from Zaza and Farewell Study (28))

Variable	Univariate Odds Ratio (95%CI) [p-value]	Multivariate Odds Ratio (95%CI) [p-value]
Female gender	1.82 (0.87-3.78) [0.11]	2.84 (1.08-7.46) [0.03]
Age	1.00 (1.00-1.01) [0.36]	
Number of years played	0.97 (0.94-1.00) [0.07]	0.95 (0.92-0.99) [0.01]
Body mass index	1.07 (1.00-1.18) [0.21]	1.19 (1.05-1.35) [<0.01]
Strings	2.22 (0.98-5.03) [0.06]	4.69 (1.52-14.52) [<0.01]
Hypermobility	0.32 (0.07- 1.52) [0.15]	
Trait anxiety	1.06 (1.02-1.11) [<0.01]	1.04 (0.99-1.09) [0.09]
Performance anxiety	1.12 (0.98-1.28) [0.10]	
Work/study stress	1.66 (1.15-2.39) [<0.01]	
General life stress	1.51 (1.06-2.15) [0.02]	
Musical warmup	0.46 (.22-.98) [0.04]	0.37 (0.15-0.91) [0.03]
Physical warmup	0.34 (.093-1.23) [0.10]	
Other changes	5.87 (2.05-16.80) [<0.01]	
Professional musician status	0.53 (0.26-1.10) [0.09]	

Table 9. Univariate and Multivariate Logistic Regression Results with History of a Playing-Related Musculoskeletal Disorder at Any Time as the Dependent Variable (from Zaza and Farewell (28) Study)

Variable	Univariate Adjusted[a] Odds Ratio (95%CI) [p-value]	Multivariate Odds Ratio (95%CI) [p-value]
Female gender	1.42 (0.87-2.3) [0.17]	1.66 (0.92-3.023) [0.10]
Age		
Number of years played	0.99 (0.97-1.01) [0.45]	0.98 (0.96-1.01) [0.15]
Body mass index	1.05 (0.98-1.12) [0.16]	1.07 (0.99-1.15) [0.08]
Strings	1.49 (0.88-2.50) [0.14]	1.94 (1.02-3.70) [0.08]
Hypermobility	0.30 (0.11-0.82) [0.02]	0.30 (0.10-0.90) [0.03]
Trait anxiety	1.03 (1.01-1.06)[0.02]	1.03 (1.00-1.06) [0.05]
Performance anxiety	1.09 (1.00-1.18) [0.04]	
Work/study stress	1.41 (1.10-1.81) [<0.01]	
General life stress	1.25 (0.99-1.58) [0.06]	
Musical warmup	0.64 (0.38-1.07) [0.09]	0.74 (0.41-1.33) [0.31]
Physical warmup	0.08 (0.18-0.84) [0.02]	0.41 (0.16-1.01) [0.05]
Other changes	5.69 (2.49-12.97) [<0.01]	
Breaks	0.53 (0.32-0.89) [0.02]	1.00 (0.43-2.25) [0.98]
Past PRMD X Breaks		0.33 (0.10-1.02) [0.06]

[a]Adjusted for past playing-related musculoskeletal disorders

ix. Davies and Mangion (17) provided a questionnaire to 533 classical and non-classical musicians in the Sydney music industry. The sample included professional musicians and music teachers. Two-hundred and forty instrumentalists completed the survey (45% response rate). Three outcome measures were examined: 1) pain or symptoms ("pins and needles, swelling, muscle weakness, loss of control") ever, 2) pain or symptoms in the last 12 months, and 3) severe pain/symptoms over a playing lifetime (interfered with ability to play, persisted long after finished playing, made non-playing activities difficult). Table 10 shows the multivariate results. The authors only reported p-values and did not present the univariate results.

Table 10. Multivariate Analysis Results in Davies and Mangion (17) Study (numbers represent p-values)

Variable	Pain/Symptoms Ever	Pain/Symptoms Last 12 Months	Pain/Symptom Severity
Gender		0.05	
Number of playing years	0.01	0.03	
Instrument	<0.01		<0.01
Playing-related stressors	0.04	0.05	
Health status		0.01	
Playing-related tension	<0.01	<0.01	0.01
Prevention behaviors	<0.01	<0.01	0.01
Gender X instrument		<0.01	
Stress X warmup X breaks			0.01

x. Yee et al. (26) examined physical stressors (posture, forces), pain and discomfort, attitudes toward pain, and general physical and mental health status in 33 female graduate and undergraduate piano students. Posture was measured with the Adapted Posture Repetitiveness and Risk Factors Index (APRRI), a 3-camera videotaped assessment originally used to measure task repetition and posture in video display terminals, and adapted to quantify stress while piano playing. Pain and discomfort was measured with a questionnaire called the Upper Body Musculoskeletal Assessment (UBMA). Attitude toward pain was measured with a questionnaire called the Survey of Pain Attitudes-Revised (SOPA-R). General physical and mental health status was measured with a questionnaire called the SF-36. SF-36 included physical and mental subscales (in addition to other subscales not reported in the article). A general demographic questionnaire was also given. Multiple linear regression showed that the APRRI, UBMA and SOPA-R accounted for 29% of the variance in the SF-36 physical subscale and 5% of the variance in the SF-36 mental subscale. The APRRI did not contribute significantly to the variance in the SF-36 physical or mental subscales. The correlation between the SF-36 physical subscale and number of playing years was 0.45.

xi. Pak and Chesky (39) recruited 455 piano or keyboard instrumentalists to complete an internet survey that included demographics, musculoskeletal problems (pain and severe pain prevalence) and musical training. Age was inversely related to pain prevalence (youngest had highest prevalence) and women reported higher pain prevalence than men. Musical type (e.g., church, classical, jazz, etc.) and playing time were not related to overall pain prevalence or severe pain prevalence.

xii. Shields and Dockrell (23) administered a questionnaire to 182 undergraduate university piano students in Ireland. There were 159 questionnaires returned (87% response rate). They found that more practice frequency (times per week) or duration (hours/week) tended to be associated with a higher injury incidence. Groups reporting practicing 5, 6, or 7 days/wk had 26%, 17%, and 36% injury incidence, respectively. Groups practicing ≤3 hr/day had a 24% injury incidence while those practicing 3.5 to 7 hr/day had a 44% injury incidence.

xiii. DeSmet et al. (19) administered a questionnaire concerning playing habits and overuse musculoskeletal problems to 66 young, high level pianists. Hand size and hypermobility were assessed. Practice duration, playing additional instruments, warming-up, relaxation exercises, frequency of sports activity, and post-practice stretching were not different between those with and without musculoskeletal problems. There were no significant differences in hypermobility between those with and without problems. Men and women with larger hand sizes had fewer musculoskeletal problems.

xiv. Larsson et al. (5) measured hypermobility and administered a playing habits and musculoskeletal symptoms questionnaire to 660 university music students and staff. Hypermobility was measured using the 5-joint Carter-Wilkinson criteria. Individuals who were hypermobile in the wrist/fingers were less likely to experience musculoskeletal symptoms than those not hypermobile (5% vs. 18%, $p<0.01$); however, those hypermobile in the knees (<1% vs. 5%, $p<0.01$) or spine (23% vs. 11%, $p<0.01$) were more likely to experience symptoms. The authors hypothesized that wrist/finger hypermobility may be assets in playing instruments but hypermobility of the knees and spine may be a liability during long periods of practice and performance.

(d) Summary of Studies on Other Risk Factors.

i. Years of Playing Experience. Shorter musical careers are associated with a higher risk of playing-related pain and musculoskeletal symptoms compared to longer musical careers. This holds for both recent symptoms or symptoms over an entire career in most (16, 17, 28) but not all (35) investigations. Pak and Chesy (39) found younger instrumentalists were more likely to report symptoms and they are likely to be individuals with shorter musical careers. It is possible that those with severe symptoms may be more likely to quit playing their instrument and thus only those without symptoms ("survivors") were still available to be surveyed later in their careers.

ii. Amount of Playing. Generally, most investigations (16, 23, 29, 44) show that as the number of practice hours per week increases, injuries or musculoskeletal symptoms increase. One study found no difference in practice hours between those with and without pain (24) while another found conflicting results (22).

iii. Breaks While Playing. Lack of breaks while playing may be a risk factor among experienced professional musicians. In the study by Zaza and Farewell (28), professional musicians taking fewer playing breaks were at higher risk for recurrent PRMD. In the study by Davies and Mangion (17) there was an interaction between stress (not well defined) and lack of breaks/warm-up (the "breaks" and "warm-ups" were combined into a single question) such that under high stress situations, lack of breaks/warm-up increased symptom severity. In the study by Yeung et al. (16) about the same proportion of musicians with and without PRMC took breaks during practice sessions (96% vs. 92%, p=0.57); breaks were not an independent risk factor in multivariate analysis but the sample size of this study was very small (n=39) and most musicians took breaks. Manchester and Parks (44) and Zaza (35) found that taking breaks increased injury risk. The authors interpreted this to possibly mean that after an injury the musician was more likely to take breaks. This was supported by the fact that, in one case-control study of student musicians (44), breaks progressively increased from the freshman to senior year among the cases but not the controls and it was only in the senior years that breaks were associated with a higher injury rate.

iv. Musical Warmup. Warming-up with the instrument prior to practice or performance may reduce musculoskeletal symptoms. Zaza (35), found that students taking a warm-up were at higher risk for current and past musculoskeletal problems than those not taking a warm-up. They interpreted this to mean that those taking a warm-up were likely to do so because of the injury. This interpretation was supported when, in a later study Zaza and Farewell (28) found that individuals who reported performing a musical warm-up were at lower risk of currently having a PRMD. Davies and Mangion (17) (as noted above) found an interaction between stress (not well defined) and self-reported lack of breaks/warm-up (breaks and warm-up were apparently combined into a single question) such that under high stress situations, lack of breaks/warm-up increased symptom severity. On the other hand, Yeung et al. (16) found that about the same proportion of musicians with and without playing-related musculoskeletal complaints reported performing a musical warm-up but the sample size in this study was small (n=39).

v. Exercise and Physical Activity. It is not clear if regular exercise is associated with reduced musculoskeletal symptoms. Roach et al. (24) found that student instrumentalists without joint pain performed more hours of physical activity and spent more hours per week walking than those with joint pain. Despite the small sample size (n=39), in the Yeung et al. study (16) lack of physical exercise emerged as a significant risk factor for PRMC in multivariate analysis among professional musicians. On the other hand, Manchester and Park (44) found no relationship between injuries and regular aerobic or strength training exercises in music students. Zetterberg et al. (22) found that more physical exercise was associated with more knee and foot pain; however, as noted above, pain in this location is very rare in instrumentalists.

vi. Several studies provided self-reported exercise prevalence in musicians. The usefulness of this data is limited however, because no study has reported the actual exercise question asked of the musicians. Manchester and Flieder (43) found that 31 of 63 (49%) music students reporting to a university health clinic for a performance-related hand problem reported participating in a regular exercise program. Yeung et al. (16) reported that 58% of their sample of professional orchestral musicians from Hong Kong reported performing regular exercise; however, their sample size involved only 39 musicians. Fishbein et al. (32) in a large (N=2212) and diverse survey of professional musicians (47 orchestras) found that 61% reported that they did regular physical exercise but the proportion of exercisers declined with age. Members of the Baltimore Colts Band estimated an average of 6.5 hours per week of physical exercise (31).

vii. BMI. There is contradictory data on the influence of BMI on musculoskeletal symptoms. Roach et al. (24) found no association between BMI and musculoskeletal symptoms but surveyed a lean student population where it might have been difficult to get a broad BMI range. In multivariate analysis, Zaza and Farewell (28) found higher BMI to be a significant risk factor for musculoskeletal symptoms. They used a much more diverse population of students and professional musicians.

viii. Hypermobility. Hypermobility may reduce the incidence of musculoskeletal disorders in musicians because it may be easier for those who are hypermobile to perform difficult hand movements needed on some instruments (e.g., certain chords on a violin, guitar, or piano). The Carter and Wilkerson (59) test for hypermobility involves 5 evaluations: 1) passive opposition of the thumb to the flexor aspect of the forearm, 2) passive hyperextension of the fingers parallel with the extensor aspect of the forearm, 3) hyperextension of the elbow 10 degrees or more, 4) hyperextension of the knee 10 degrees or more, and 5) forward flexion of the trunk with knees straight so that the palms of the hands rest on the floor. Individuals with 0, 1, 2, 3, 4 or 5 of these features comprise respectively 43%, 26%, 15%, 9%, 6%, and 3% of the population (60). The modification of Beighton (61) involves extension of the wrist and metacarpal phalanges. Zaza and Farewell (28) used the Carter and Wilkerson criteria for hypermobility eliminating the knee hyperextension test and substituting the Beighton modification. Musicians positive on all 5 tests were considered hypermobile. In both univariate and multivariate analysis, those who were not hypermobile were at greater risk of having a current playing-related musculoskeletal disorder. Manchester and Park (44) did not find any difference between injured and non-injured students in terms of "hypermobility" but the hypermobility was simply defined as the response to a question on whether or not the students considered themselves to be "double jointed". In another study, the prevalence of hypermobility (defined as hyperextension of the metaphalangeal joint of the index finger) did not appear to be any higher in classical guitar players than in the normal population (62).

ix. Psychological Factors. Higher levels of playing-related stress or tension, trait anxiety, performance anxiety, work/study stress, and general life stress have also been shown to be related to both current and past musculoskeletal symptoms (17, 28). In multivariate analysis involving trait anxiety, performance anxiety, work/study stress, and general life stress (along with other risk factors), the only psychological factor to emerge as a significant risk factor for current and past playing-related musculoskeletal disorders was trait anxiety (28). This may suggest that musicians more susceptible to musculoskeletal problems are those with a tendency to respond with anxiety to any perceived threatening situation.

x. Pain Management/Relaxation Techniques. Manchester and Park (44) found that students with playing-related hand injuries were more likely to have taken lesions on Alexander technique or Feldenkrais method. The authors reasoned that this may have been due to formerly injured students taking Alexander or Feldenkrais lessons as part of the rehabilitation process.

(5) Intervention Studies.

(a) Very few studies have been conducted to examined interventions to reduce symptoms or injuries in musicians, although there are no lack of opinions on this topic (48, 63-65). Only 3 intervention studies were found and each is reviewed below.

(b) Spahn et al. (66) examined the effects on musculoskeletal symptoms of a course given to students at the Zurich Conservatory. Students were given a total of 17 two-hour sessions over 17 weeks. Each 2-hour session was divided into a theoretical hour and a practical hour. The course content is in Table 11. Considerable time was spent discussing the musculoskeletal system but other topics were discussed as well. Twenty-two students took the course while a matched group of 22 did not. Students were matched on age, sex, course of study (what "course of study" involves is not clear in the article), number of semester hours, and instrument. The course was evaluated using several questionnaires administered at the start and end of the 17-week course. Only the results related to musculoskeletal symptoms are discussed here. One questionnaire was called the "Epidemiological Questionnaire for Musicians" and had 14 items including basic demographics, symptoms while playing, kind and duration of symptoms, and degree to which symptoms interfered with playing. Another questionnaire (Coping with Work as a Musician) had a "Symptoms While Playing" scale. Results indicated that at the start of the investigation, 61% (n=14) of the students in the class had symptoms compared with 26% (n=6) of the controls ($p<0.05$), according to the Epidemiological Questionnaire. The severity of symptoms was also greater in the students attending the class. On the Coping with Work as a Musician Questionnaire, students in the class reduced their symptoms to the same level as the students not in the class at the end of the 17-weeks. On the Coping with Work as a Musician Questionnaire both groups improved but an interaction effect indicating that the students taking the class improved more. This was an elective course, so it would not be surprising that students with problems would be more likely to attend. Also, the

end-of-course questionnaire could have been influenced by the desire on the part of the students to report success in the program.

Table 11. Course Content of Spahn et al. (66) Study

Session	Theoretical Portion	Practical Portion
1	Introduction; causes of pulled muscles	Quick relaxation exercise; posture exercise
2	Proprioception and motor control; neurological foundations	Preparatory exercises for free mobility and regulation of tension
3	Methods to improve motor control	Support and posture exercise
4	Influence of lower extremity on playing motion and breathing	Exercises for foot and leg muscles while standing and sitting
5	Significance of the pelvis and lower spinal column for the connection of posture and breathing	Exercises for the pelvis and the lower back and abdominal muscles
6	Significance of the upper spinal column for breathing, resonance, and sense of space	Exercises for standing and sitting; breathing exercises
7	Course and fine motor control of the upper extremities	Exercises for the upper extremity in conjunction with the coordination of the entire body
8	Reliable prevention approaches in music and musical pedagogy	Practical examples at the instrument and while singing
9	Self-instruction styles; quality characteristics of teaching	Practical examples at the instrument and while singing
10	Strings and plucked instruments: ergonomics and coordination of movement	Sample instruction, playing analysis, and group exercises
11	Keyboard instruments: specific and generalizable requirements	Sample instruction, playing analysis, and group exercises
12	Wind instruments and voice: posture, attack, support and breathing techniques	Sample instruction, playing analysis, and group exercises
13/14	Practice and learning strategies, mental training	Practical examples and further training procedures
15/16/17	Stage fright, proprioception and psychomotor aspects	Exercises for the stage; concluding discussion

(c) Ackermann et al. (67) examined the effects of muscular strength vs. muscular endurance training on students at the Canberra School of Music (Australia). One group of students (n=10) performed a strength routine (n=10) and another group (n=9) performed a muscular endurance routine (n=9). Both groups exercised 2 times per week for 6 weeks. Both groups performed 11 exercises that included biceps curl, lateral raises, shoulder forward flexion, bent-over row, sit-ups, push-ups, reverse fly, triceps extension, back extension, shoulder extension, opposite shoulder and hip extension. The last 5 exercises were performed prone over a Swiss Ball. Students in the strength group performed a 6-8 repetition max (RM) while the

muscular endurance group performed a 25-30 RM. Before and after training the students were given tests which included: 1) horizontal shoulder flexion and extension and vertical shoulder flexion and extension on a Cybex isokinetic device at 60 degrees per second, 2) an arm hold test measuring the length of time the arms could be held at 90 degrees of forward shoulder flexion, 3) a questionnaire involving the frequency and severity of performance-related musculoskeletal disorders (PRMD), and 4) the Borg scale for rating perceived exertion (RPE) associated with playing the instrument. Improvements in each of the training exercises were also examined. Results indicated that there were no group differences on the Cybex tests with both groups showing improvement of the horizontal tests but not the vertical tests. There were no group differences or differences due to training on the arm hold test. There were no group differences on the frequency or severity of PRMD but both groups showed a decline on both frequency and severity of PRMD on the post-test. There was a greater drop in the playing-related RPE in the endurance group. When the training tests were compared, both groups improved on all tests but the groups X training effect suggested more improvement for the endurance group on the back extension and lateral raises (no difference on the other tests). Thus, both groups showed improvements on the Cybex test, reductions in playing-related RPE, and the severity and frequency of PRMD. Results slightly favored the muscular endurance group because of the more favorable RPE changes and changes in exercise-specific measures.

(d) Brandfonbrener (68) attempted to examine the effectiveness of a specific educational program on musculoskeletal symptoms of orchestral musicians. The initial sample had 138 musicians in the control group and 177 in the experimental group. All subjects were administered a questionnaire at three points in the 1 year investigation: a pretest (before intervention) at the start of the fall concert season (Time 1), at the midpoint (Time 2, February or March), and about 1 year later at the start of a second fall concert season (Time 3). The questionnaire contained questions on musculoskeletal symptoms in addition to demographic questions, questions on practice/playing time, medical treatment received, and other topics. The experimental group received a lecture on basic physiology, anatomy, psychology, and posture. They were given hand-outs with specific strengthening and flexibility exercises they were to perform as part of the intervention (exercises are not described); in addition, they were given several pieces of equipment to assist in performing these exercises including therabands, exercise foam, rubber pads, and exercise gloves. One experimental subgroup began with strengthening exercises while the other experimental subgroup began with flexibility exercises. The groups switched exercise programs at Time 2. The control group did not receive any intervention and only answered the questionnaires. Drop-outs (Time 1 to Time 3) were 47% and 25% for the experimental and control groups, respectively. There were significant differences between the two groups in the proportion of musicians reporting musculoskeletal symptoms at Time 1 (67% for experimental, 54% for control, $p=0.02$). At Time 2 the proportion of subjects reporting symptoms decreased 22% for the control group compared to Time 1 (from 54% to 42%), but only 5% for the experimental group (from 67% to 64%). At Time 3, the proportion of control subjects reporting symptoms increased compared to Time 2 (42% to 48%) but the proportion of

experimental subjects reporting symptoms remained about the same (64% to 63%). This intervention was not successful in reducing musculoskeletal symptoms.

(e) Based primarily on risk factor data, Zaza (63) recommended the interventions shown in Table 12. These were recommended because they were considered by Zaza as unlikely to cause harm and might be potentially helpful. Zaza (69) classified risk factors on the basis of importance and changeability as shown in Table 13.

Table 12. Prevention Techniques Recommended by Zaza (63)

Practice Behavior Modifications	Other Modifications
Musical warm-up	Body movement awareness
Breaks	Posture
Pacing	Breathing
Variety of content	Instrument adaptations
Cognitive rehearsal	Exercise
	Anatomy of playing an instrument
	Stress management
	Anxiety management

Table 13. Categorization of Behavioral and Nonbehavioral Risk Factors According to Importance and Changeability (69)

Greater----------→ Less Importance		Greater - - -C -h -a -n -g -e -a -b -i -l -i -t -y - - Less
Practice habits Duration of Session Breaks Variety of content Amount of practice Practicing away from instrument Performance anxiety Management of stress and anxiety	Practice habits Variety of content	
Practice habits Posture Non-musical factors Stress management Non-behavioral factors Teacher Repertoire Instrument group Instrument size	Non musical factors Strength General physical condition	

6. METHODS. Data on the US Army Band was obtained from six major sources: 1) historical information on Band members provided by the Band itself, 2) medical and demographic data of Band members provided by the Defense Medical Surveillance System (DMSS), 3) audiograms from the Defense Occupational and Environmental Health Readiness System-Hearing Conservation (DOEHRS-HC) and sound monitoring of a Band rehearsal, 4) focus group interviews of Band members, 5) questionnaires completed by Band members, and 6) observations on band activities.

a. Historical Band Data: Membership, Fitness, and Physical Characteristics.

(1) Data provided by the Band was in an Excel file that contained a list of band members, as well as each Soldier's Army Physical Fitness Test (APFT) raw scores (70), height, weight, time in military service, arrival date at the Band, and unit. Height and weight were obtained during the APFT and these variables were used to calculate body mass index (BMI) as weight/height^2 (71).

(2) Additional information provided by the Band was a historical list of limited duty profiles given to US Army Band members. A separate list was provided for each of the Band units. The time period that each unit had been collected injury profile data was variable. The earliest profile dates ranged from May 1997 to April 1999 in the various Band units. However, the data from 2000 to 2005 appeared to be complete and these data were analyzed.

(3) The third and final piece of information provided by the Band was the Ceremonial Unit mission load. This was simply a list by year of "stand-up" missions and bugle missions performed by the Ceremonial Band unit from 1992 to 2006. "Stand-up" missions involved musicians on their feet for periods of about 90-120 minutes. Our point of contact within the band (20 years of Band service) told us that Soldiers were typically at parade rest and attention for periods of 15-30 minutes with periods of marching from 15-30 minutes. Typical "stand-up" missions (full honor funerals) are described in Appendix E. Bugle missions were generally wreath layings at the Tomb of the Unknowns or simple honor funerals at the Arlington National Cemetery. Wreath layings were conducted every 30 minutes throughout the day and were done in shifts over several hours by buglers. "Stand-up" and bugle mission data from 1992 to 2005 were analyzed.

b. Defense Medical Surveillance System Data: Medical and Demographic Data.

(1) A list of the Band Soldiers was sent to the DMSS and the DMSS provided International Classification of Diseases, Version 9 (ICD-9) codes for all outpatient medical visits (medical encounters) that occurred in calendar years 2004 and 2005 from the Standard Ambulatory Data Record (SADR). Once the data were obtained, specific groupings of ICD-9 codes indicative of injury were selected to develop 4 injury indices as described previously (72).

These injury indices were the Installation Injury Index (III), the Modified Installation Injury Index (MIII), the Training-Related Injury Index (TRII), and the Comprehensive Injury Index (CII). The III and TRII were previously developed by personnel at the DMSS. The III has been used to compare injury rates among military installations. The TRII has been used to compare injury rates among basic training units and focuses on lower extremity overuse injuries. The III is reported on a monthly basis at the DMSS website (http://amsa.army.mil); the TRII is reported on a periodic basis to the Army Training and Doctrine Command (TRADOC) surgeon. The MIII and the CII were developed by personnel in the Injury Prevention Program at the USACHPPM. The MIII attempts to capture a greater number of injuries than the III. The CII captures all ICD-9 codes related to injuries.

(2) Anatomic locations of injuries in the DMSS Band data were also determined based on ICD-9 codes where possible. Many ICD-9 codes are anatomic site-specific (e.g., 922, contusion of the trunk) while others have a fifth digit indicating a specific anatomic location for general condition (719.41 dislocation, shoulder region). When a location could not be determined that ICD-9 code was identified as anatomy "unspecified." V-codes (supplementary classifications of factors influencing health status and contact with health services) did not generally specify an anatomic location and these were treated separately.

(3) Some demographic data was also obtained from the Defense Manpower Data Center (DMDC) database and these data were supplied by the DMSS. Data included date of birth, gender, educational status, marital status and race. Age was calculated from date of birth to 31 December 2005.

c. Defense Occupational and Environmental Health Readiness System -Hearing Conservation (DOEHRS-HC) and Sound Level Monitoring Data.

(1) The DOEHRS-HC database was accessed for all Band members. The most recent hearing test on each band member was obtained and the numbers of Soldiers completing tests were plotted by year. Profiles were calculated based on the audiometric data.

(2) Sound level monitoring was conducted during a rehearsal of the herald trumpets (see Appendix E). Measurements were made using a Larson Davis (LD) Type 800B sound level meter and a LD Type 2559 microphone. All instruments were within the valid calibration requirement as measured with a Bruel & Kjaer Type 4230 calibrator.

d. Focus Group Interviews.

(1) Focus group interviews were conducted with Band members to: 1) assist with development of a questionnaire to be administered to the entire Band, 2) obtain perceived risk factors for musculoskeletal problems, and 3) obtain suggestions Band members might have on

reducing the incidence of musculoskeletal problems. Focus group interviews were conducted on a random sample of the Band stratified on unit, functional grouping (instrumental group or support group) and gender (see Appendix F). Stratification variables were determined based on preliminary analysis of the medical data from the DMSS in which unit and functional grouping were found to be risk factors for injuries (discussed in detail later). Although gender was not identified as a risk factor in this preliminary analysis it was thought that some gender differences could exist and that women may have a different perspective from the men that could add to the analysis.

(2) Sixty-three Band members were selected and requested for interview in 10 different focus groups as shown in Table 14. Two groups of ceremonial Band members, 2 groups of concert band members, and 2 groups of support members were included because of the larger sizes of these groups. Also interviewed was a separate group of Band members who volunteered to talk to us. Thus, there were a total of 11 focus group interviews.

(3) Four EPICON team members interviewed each focus group. These 4 team members served roles as questioner, note taker, timer, and taper (tape recorder operator). The questioner asked the structured interview questions, focused on the respondents, and kept interview moving and focused. The note taker transcribed the information discussed, concentrating primarily on risk factors for pain/injuries/discomfort and ways of reducing injures as suggested by the band members. The facilitator wrote Band member comments on a large easel that everyone could see, ensured everyone in the group had their say, and suggested items for follow-up discussion. The timer kept everything on schedule by following the passage of time during the interview and informed the questioner when they were near the end of the time allotted for a particular topic. The taper assured the functionality of a tape recorder and was responsible for downloading the tapes at conclusion of the interview.

Table 14. Focus Group Interviews and Question Sets (Question Sets at Appendix C)

Group Number	Unit	Personnel Requested (n)	Question Set
1	Blues	4	Instrumentalists
2	Ceremonial	7	Instrumentalists
3	Ceremonial	7	Instrumentalists
4	Chorus	6	Mixed Vocalists and Instrumentalists
5	Concert	7	Instrumentalists
6	Concert	7	Instrumentalists
7	Strings	5	Instrumentalists
8	Admin	8	Support
9	Admin	8	Support
10	Chorale	4	Vocalists

(4) The structured interview questions used in the focus groups are at Appendix C. The interview involved four major topics: 1) perceived risk factors for injuries, 2) experienced pain, soreness, discomfort, or injuries, 3) suggestions for reducing injuries and 4) hearing risks. There were separate question formats for 1) instrumentalists, 2) vocalists, 3) mixed vocalists and instrumentalists, and 4) support. The questions for different groups differed only slightly in wording as shown in Appendix C. A preliminary questionnaire was designed prior to the focus group interviews based on the literature review. Focus group members were asked to review and comment on this preliminary questionnaire as part of the focus group interview.

e. Questionnaires.

(1) Questionnaires were designed based on the literature review and suggestions/ comments during the focus group interviews. There were 4 separate questionnaires for 1) instrumentalists, 2) vocalists, 3) support group, and 4) conductors. The only difference in these questionnaires was a slight change in the wording so that the question was applicable to the group (e.g., referring to "playing" for instrumentalists and "singing" for vocalists). Questionnaires for each group are at Appendix D.

(2) Each questionnaire contained an initial section that was group-specific (instrumentalists, vocalists, support, conductors). Other sections were almost identical dealing with 1) exercise and sport frequency and duration, 2) tobacco use, 3) medical problems and medical care, and 4) hearing. A final open ended question allowed for any additional thoughts the Soldiers had. In pilot studies, the questionnaire took 10-15 minutes to complete.

f. Observations on Band Activities. To better understand what types of activities were performed by the Band, we observed several band functions. Since the weight and size of some instruments were mentioned as problems in the focus group interviews, we also measured the weights of several of the larger Band instruments.

g. Data Analysis.

(1) Descriptive data (means, standard deviations (SD), frequencies) were determined for all 1) historical information provided by Band itself, 2) medical and demographic data of Band members provided by the DMSS, 3) audiograms from the DOEHRS-HC and audiometric monitoring, and 4) questionnaire responses. For continuous variables, means and standard deviations (SD) were calculated; for ordinal/nominal data, frequencies and proportions were determined. Gender differences in some factors were determined by independent sample t-tests. Comparison of injury incidence across years was determined by the McNemar test (which allows for comparison of frequency data involving repeated measures on the same individuals). Comparison of gender differences in injury rates was determined by a chi-square test for rates (73).

(2) Several questionnaire responses involved the frequency and duration of certain kinds of activity. To approximately calculate the total amount of time in each kind of physical activity (minutes/wk), the weekly frequency (times/week) was multiplied by the session duration (minutes). However, while activity frequencies ranged from 0 to 7 and covered each of the possible days per week (i.e., 0 days/wk, 1 day/wk, 2 days/wk, etc.), durations were in ranges (None, <15 min, 16-30 min, etc.). Thus, the approximate midpoint of the duration ranges was selected for the calculation. The ranges durations differed for different questions. In Appendix H are the values selected to represent the midpoint of the ranges.

(3) Focus group interview responses were compiled by Band unit. Responses were grouped into major categories and subcategorized in more specific responses within these major categories. Similarly, responses to opened-ended questions on the questionnaires were grouped into major categories and subcategorized in more specific responses within these major categories.

(4) For the risk factor analysis, three outcome measures (dependent variables) were analyzed. These were 1) documented injuries in 2005 from the DMSS, 2) self-reported duty-related injuries in 2005 from the questionnaire, and 3) current musculoskeletal symptoms from the questionnaire. Independent variables included demographics, physical characteristics, physical fitness, and questionnaire responses. Univariate analysis was performed by chi-square examining differences in the outcome measures among various levels of the independent variables. All continuous variables were converted to quartiles (4 approximately equal groups) or tertiles (3 approximately equal groups) based on the distribution of the variable. For documented injuries in 2005 and self-reported duty-related injuries in 2005, only Soldiers who were present in the Band for all of 2005 were included; for current musculoskeletal symptoms prevalence, all Soldiers who completed the questionnaire were included. For each of the 3 outcome measures, separate multivariate analysis was performed using a backward stepping logistic regression procedure. All independent variables with a p-value ≤ 0.25 in the univariate (chi-square) analysis were included in the logistic regression (74).

7. RESULTS.

a. Band Data and Demographics.

(1) Army Band Structure, Instruments, and Functional Groupings

(a) There were a total of 264 Army Band members, 209 men and 55 women. The Soldiers served in 7 separate units as shown in Table 15. Each unit, with the exception of Support, had an officer that served as the conductor (officer/conductors are not shown in Table 15). The Band as a whole was commanded by a Colonel who also served as the conductor of the Concert unit.

Table 15. Army Band Units[a]

Unit	Men (n)	Women (n)	Total (n)
Blues	17	1	18
Ceremonial	60	11	71
Chorale	9	7	16
Chorus	29	0	29
Concert	52	16	68
Strings	7	14	21
Support	29	6	35
Total	203	55	258

[a]Each unit with the exception of support had a male officer that serves as the conductor. Officers (n=6) are not included in this table.

(b) The Blues Jazz ensemble had 5 trumpets, 5 saxophones, 4 trombones, 1 guitar, 1 percussion, 1 piano, and 1 string bass. The Ceremonial Band had 20 trumpets, 10 trombones, 9 clarinets, 7 percussion, 6 tubas, 5 euphoniums, 5 French horns, 5 saxophones, 3 flutes and 1 drum major. The Chorale had 4 sopranos, 3 altos, 2 tenors, 3 bass, 2 piano players, 1 guitar, and 1 percussion. The all male Chorus had 7 first tenors, 6 second tenors, 7 baritones, 7 basses and 2 piano players. The Concert Band had 16 clarinets, 8 trumpets, 6 trombones, 6 French horns, 6 percussion, 5 flutes, 5 saxophones, 4 oboes, 3 euphoniums, 3 bassoons, 3 tubas, 2 string basses, and 1 harp. The Strings unit had 11 violins, 4 violas, 4 cellos, 1 string bass, and 1 accordion. The Support unit was diverse consisting of individuals involved in staging (n=8), audio/lighting (n=8), library functions (n=5), supply (n=3), production (n=3), administration (n=3), operations (n=2), information management (n=2), and transportation (n=1).

(c) The Band members were placed into 9 functional groupings with the instrumental grouping (brass, strings, woodwinds, percussion, and keyboard) based on past literature ([Manchester, 1988 #2750; Middlestad, 1989 #2766; Larsson, 1993 #2747; Morse, 2000 #2740]). The support group was separated into 2 groups (staging/lighting and administration) because we observed considerable difference in function and injury rates in the preliminary analysis. The staging/lighting group was involved in setting up for Band functions which involved moving and lifting of equipment; the administrative group was mostly involved in office work. The functional groups and the number of men and women in each are shown in Table 16.

Table 16. Army Band Functional Groupings

Functional Group	Men (n)	Women (n)	Total (n)
Brass	89	7	96
Woodwinds	21	19	40
Strings	21	15	36
Percussion	15	1	16
Keyboard	6	0	6
Vocal	22	7	29
Conductors	6	0	6
Support (stage/lighting)	16	0	16
Support (admin)	13	6	19

(2) Physical Characteristics and Physical Fitness. Table 17 shows the height, weight, BMI and APFT scores for the band members. For the men, 69% had a BMI greater than 25.0 and 13% had a BMI greater than 30.0. For the women, 18% had a BMI greater than 25.0 and none were greater than 30.0. For several APFT test events, scores were not provided for all Soldiers so the sample sizes are shown. Total APFT points were included only if the Soldier had performed all 3 APFT events (alternate events were not considered). Men and women were separated because of the large performance differences between them. Complete APFT data (i.e., scores on all 3 events) were obtained on only 70% of Soldiers (n=185).

Table 17. Physical Characteristics and Army Physical Fitness Test Scores

Characteristic/Fitness Test Event	Men		Women	
	N	Mean±SD	N	Mean±SD
Age (yrs)	209	39.9±7.7	55	38.6±8.3
Height (in)	209	70.6±2.5	55	64.7±2.6
Weight (lbs)	209	187.9±26.2	55	136.2±17.8
BMI (kg/m^2)	209	26.5±3.1	55	22.8±2.4
Push ups (reps)	188	47.4±14.1	45	26.4±10.4
Sit-Ups (reps)	192	53.8±14.5	50	58.3±15.8
Two-Mile Run (min)	155	16.1±1.4	40	18.6±1.9
Total APFT Score (points)	150	233±33	35	244±32

(3) Time in Service and Time in the US Army Band. Table 18 shows time in service and time in the Band. Men had longer average time in service compared to women (p=0.04). Time in the Band was similar for men and women (p=0.41).

Table 18. Time in Service and Time in the Band

Measure	Men	Women
Time in Service (yrs)	14.2±8.4	11.8±7.6
Time in the Band (yrs)	11.5±8.2	10.7±7.7

(4) Historical Data on Band Profiles.

(a) Figure 1 shows historical data on the number of injury profiles experienced in the Band. The total number of profiles for the entire Band has been relatively constant from 2000 through 2005. There is some suggestion of a higher number of profiles for the ceremonial unit in the 2003 to 2005 timeframe.

(b) Table 19 shows the anatomic locations for profiles. The most common anatomic locations were (in order of incidence) the foot/toes, knees, shoulders, upper back, wrist/fingers/hand, and the low back. Of the known anatomical sites (n=604), the upper body was involved in 46% (278/604) of the cases, the lower body in 46% (278/604) of the cases, and other/multiple sites involved in 8% (48/604) of the cases. Table 20 shows the profiles by type. The most common profile types were T1 and T2 of the lower body, although T2 of the upper body is also prominent. Appendix G explains profile types as specified in Army Regulation 40-501 (75).

Figure 1. Band Profiles

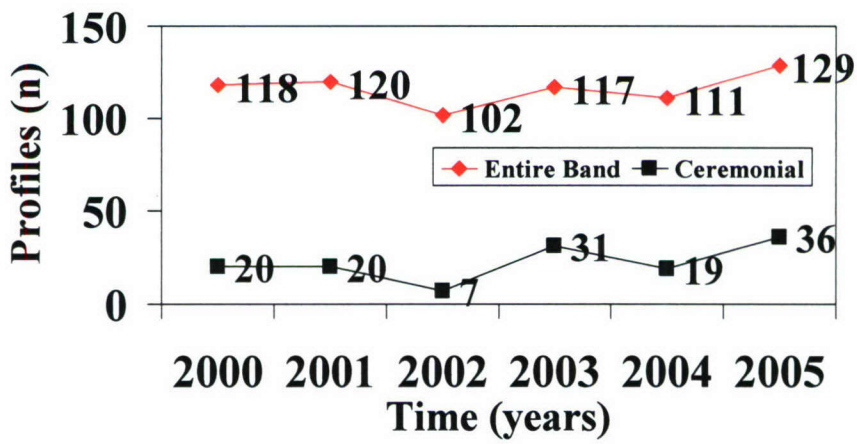


Table 19. Band Profiles by Anatomic Location (Years 2000-2005, n=697)

Anatomic Location	N	Proportion (%)		Anatomic Location	N	Proportion (%)
Face/Neck	7	1.1		Pelvis/hips	19	2.7
Chest/Abdomen	15	2.2		Legs (except knee)	19	2.7
Shoulders	81	11.6		Knee	96	13.8
Arms/Elbow	16	2.3		Ankle	39	5.6
Wrist/Fingers/Hands	55	7.9		Foot/toes	105	15.1
Upper Back	57	8.2		Other Sites	21	3.0
Low Back	47	6.7		Multiple Sites	27	3.9
				Unknown/Missing	93	13.3

Table 20. Army Band Profiles by Type (Years 2000-2005)[a]

	Physical Capacity	Upper Extremity	Lower Extremity	Hearing-Ears	Vision-Eyes	Psychiatric	Functional Area Unspecified	Total
T1	6	92	202	2			53	355
T2	5	63	96				10	174
T3								0
P2	1	11	26				2	40
P3		3	7					10
P4			2					2
Other		6	1					7
Total	12	175	334	2			65	588

[a]Profile type missing in 109 cases; see Appendix G for explanation of profiles; cells with no data had no cases

(5) Historical Data on Band Missions. Figure 2 shows the "stand-up" missions performed by the ceremonial unit. It can be seen that total missions increased from 1992 to 2002 (a 62% increase) with a slight decline in missions from 2002 to 2005 (16% decrease). The average±SD number of missions per year was 748±116 for the entire period. Figure 3 shows bugle missions which appear to have remained relatively constant in the 13-year period between 1992 and 2005. Using the data from 2000 to 2005 (n=6) there was little relationship (Pearson Product Moment Correlation) between stand-up missions and overall profiles ($r=0.29$, $p=0.58$), stand-up missions and profiles in the Ceremonial Band ($r=-0.52$, $p=0.28$), or bugle missions and profiles in the Ceremonial Band ($r=0.38$, $p=0.46$).

Figure 2. Stand-Up Missions of the US Army Ceremonial Band

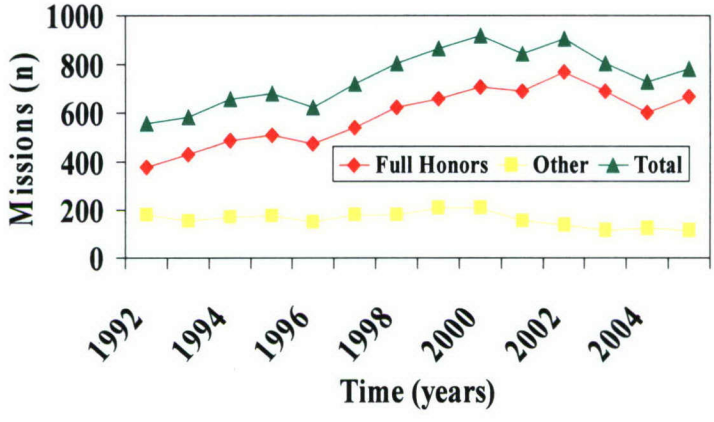
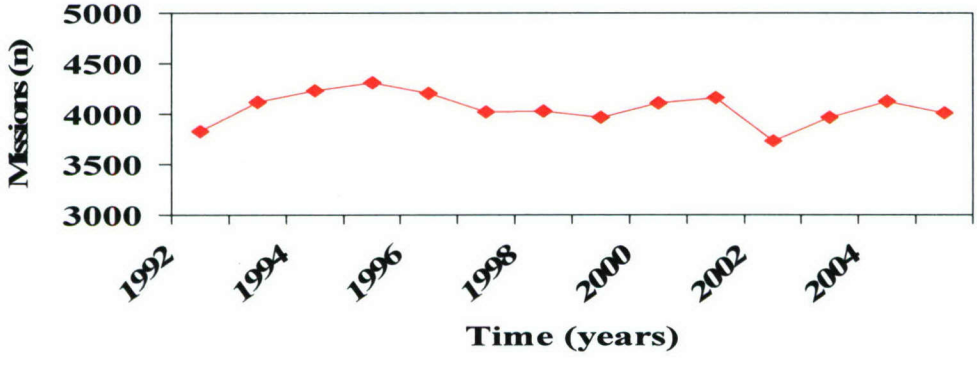


Figure 3. Bugle Missions



b. Defense Medical Surveillance System Data: Medical and Demographic Data.

(1) Army Band Demographics. Demographic information on the Band is shown in Table 21. Seventy-three percent (n=193) of Band members possessed Bachelor's degrees or higher degrees, 68% (n=180) were married, and 85% (n=224) were white.

Table 21. Educational Level, Martial Status, and Race of the US Army Band

Variable	Level of Variable	Men (n=209)		Women (n=55)	
		N	%	N	%
Educational Level	High School Graduate	45	21.5	6	10.9
	Some College	3	1.4	1	1.8
	Bachelors Degree	68	32.5	18	32.7
	Masters Degree	72	34.4	24	43.6
	Doctorate Degree	8	3.8	3	5.5
	Unknown	13	6.2	3	5.5
Martial Status	Single	38	18.2	12	21.8
	Married	147	70.3	33	60.0
	Other	16	7.7	8	14.5
	Unknown	8	3.8	2	3.6
Race	White	176	84.2	48	87.3
	Black	19	9.1	3	5.5
	Other	8	3.8	3	5.5
	Unknown	6	2.9	1	1.8

(2) Documented Injuries.

(a) Documented Injury Visits and Injury Visit Rate. Table 22 shows the DMSS data as the number of injury visits and the injury visit rate for men and women in the Band in 2004 and 2005 for 28 selected groupings of ICD-9 codes. Overall, the men in 2004 and 2005 had 498 and 483 visits for an injury in 2004 and 2005, respectively. The male injury visit rate was 238 and 231 visits/100 person-years, in 2004 and 2005, respectively. The women had 203 and 158 injury visits in 2004 and 2005, respectively. The female injury visit rate was 369 and 287 visits/100 person-years for 2004 and 2005, respectively. A chi square for person-time (73) indicated that the injury visit rates of the women were higher than those of the men in both 2004 ($p<0.01$) and 2005 ($p=0.02$).

Table 22. Injury Visits and Injury Visit Rates for Men and Women

ICD-9 Code Groups	Men				Women			
	2004		2005		2004		2005	
	Visits (n)	Rate (/100)	Visits (n)	Rate (/100)	Visits (n)	Rate (/100)	Visits (n)	Rate (/100)
354-355 Neuritis	8	3.83	3	1.44	15	27.27	6	10.91
692 Contact dermatitis	10	4.78	4	1.91	5	9.09	1	1.82
715-716 Osteoarthritis	17	8.13	30	14.35	0	-	0	-
717-718 Internal derangement of joints	13	6.22	10	4.78	5	9.09	2	3.64
719 Unspecified joint disorders	89	42.58	50	23.92	14	25.45	26	47.27
721 Spondylosis	3	1.44	1	0.48	0	-	0	-
722 Intervertebral disk disorders	23	11.00	13	6.22	1	1.82	0	-
723-724 Other spinal disorders	54	25.84	111	53.11	18	30.73	29	52.73
726 Peripheral enthesopathies	18	8.61	19	9.09	15	27.27	18	32.73
727 Other disorders of synovium, tendon and bursa	13	6.22	5	2.39	4	7.27	2	3.64
728 Disorders of muscle, ligament, fascia	13	6.22	16	7.66	4	7.27	4	7.27
729 Other soft tissue disorders	36	17.22	19	9.09	31	56.36	11	20.00
733 Other bone, joint disorders	0	-	3	1.44	5	9.09	2	3.64
736 Acquired deformities of limbs	8	3.83	13	6.22	13	23.60	2	3.64
739 Nonallopathic lesions	10	4.78	6	2.87	8	14.53	0	-
805-818 Upper body Fracture	1	0.48	10	4.78	0	-	5	9.09
820-829 Lower body Fracture	0	-	2	0.96	0	-	0	-
835-837 Lower body dislocation	10	4.78	6	2.87	0	-	0	-
840-842 Sprains/strains upper body	11	5.26	6	2.87	2	3.64	5	9.09
843-845 Strains/sprains lower body	14	6.70	24	11.48	17	30.91	2	3.64
846-847 Strains/sprains back	13	6.22	10	4.78	4	7.27	6	10.91
848 Strains/sprains other	2	0.96	7	3.35	0	-	1	1.82
870-897 Open wounds	4	1.91	6	2.87	0	-	2	3.64
910-919 Abrasions	3	1.44	3	1.44	1	1.82	1	1.82
920-924 Contusions	4	1.91	5	2.39	1	1.82	2	3.64
940-949 Burns	0	-	1	0.48	0	-	0	-
959 Unspecified injuries	10	4.78	9	4.31	0	-	6	10.91
V Codes V57.1, V57.2, or V67.4	111	53.11	91	43.54	40	72.73	25	45.45

(b) Anatomic Locations of Documented Injuries. Table 23 shows the broad anatomical locations of injuries where ICD-9 codes allowed this determination. Many ICD-9 codes are not anatomically specific but it was possible to determine an anatomic location in 64% of the cases (862/1342). For the men, the major sites of injury in both years were (in order of incidence) the low back, upper body, and lower body. For the women, the anatomic locations with the greatest proportion of injuries varied in the two years but injuries appear to be approximately evenly distributed among the upper body, low back and lower body.

Table 23. Anatomical Locations of Injuries

Location	2004				2005			
	Men		Women		Men		Women	
	N	Proportion of Locations (%)[a]	N	Proportion of Locations (%)[a]	N	Proportion of Locations (%)[a]	N	Proportion of Locations (%)[a]
Upper Body	105	27	35	21	101	26	38	29
Lower Body	62	16	48	29	102	26	34	26
Low Back	138	36	20	12	126	32	36	27
Multiple Locations	8	2	1	1	6	2	2	2
Unspecified Locations	74	19	59	36	57	15	23	17
V-Codes	111	---	40	---	91	---	25	---

[a]Exclusive of V-Codes

(c) Cumulative Incidence of Documented Injuries.

i. Table 24 shows a comparison of the cumulative incidence of documented injuries among men and women for the 4 injury indices in years 2004 and 2005. Only individual men and women who were in the Band for the entire year were considered so the time at risk would be similar for all Soldiers. In 2004 there were 193 men and 50 women (n=243) who were Band members the entire year. In 2005 there were 202 men and 53 women (n=255) present for the entire year. Men and women did not differ significantly in cumulative injury incidence for any index.

Table 24. Gender Comparison of the Four Injury Indices

Year	Index	Men (% injured)	Women (% injured)	p-value[a]
2004 (male n=193; female n=50)	Comprehensive Injury Index	45.1	50.0	0.53
	Installation Injury Index	38.3	40.0	0.83
	Modified Installation Injury Index	44.6	44.0	0.94
	Training-Related Injury Index	34.7	42.0	0.34
2005 (male n=202, female n=53)	Comprehensive Injury Index	51.5	50.9	0.94
	Installation Injury Index	42.1	49.1	0.36
	Modified Installation Injury Index	47.5	49.1	0.84
	Training-Related Injury Index	39.6	41.5	0.80

[a]Chi-square

ii. Table 25 shows a comparison of the cumulative injury incidence in 2004 vs. 2005 for the 4 injury indices with men and women combined. Again, only men and women who were in the Band for the entire duration of their respective years were considered so the time at risk

would be similar for all Soldiers. Injury incidence in 2005 tended to be slightly higher than in 2004.

Table 25. Year Comparison of the Four Injury Indices

Index	2004 (% injured) n=243	2005 (% injured) n=255	p-value[a]
Comprehensive Injury Index	46.1	51.4	0.15
Installation Injury Index	38.7	43.5	0.16
Modified Installation Injury Index	44.4	47.8	0.36
Training-Related Injury Index	36.5	40.0	0.30

[a]McNemar Test

(d) Medical Visits and Injured Soldiers for Documented Injuries. Table 26 shows the number of injury visits, the number of injured Soldiers, and the calculated visits/injured Soldier. Injured Soldiers were determined based on the CII. The data indicates that injured Soldiers tended to have a high number of repeat visits. Women had more repeat visits than men. This would be expected since injury incidence was similar in men and women but the injury visit rate was higher in women.

Table 26. Visits and Injured Soldiers

Variable	2004		2005	
	Men	Women	Men	Women
Visits (n)	498	203	483	158
Injured Soldiers (n)	87	25	104	27
Visits/Injured Soldier	5.7	8.1	4.6	5.9
Range of Visits (n)	1-43	1-35	1-38	1-18

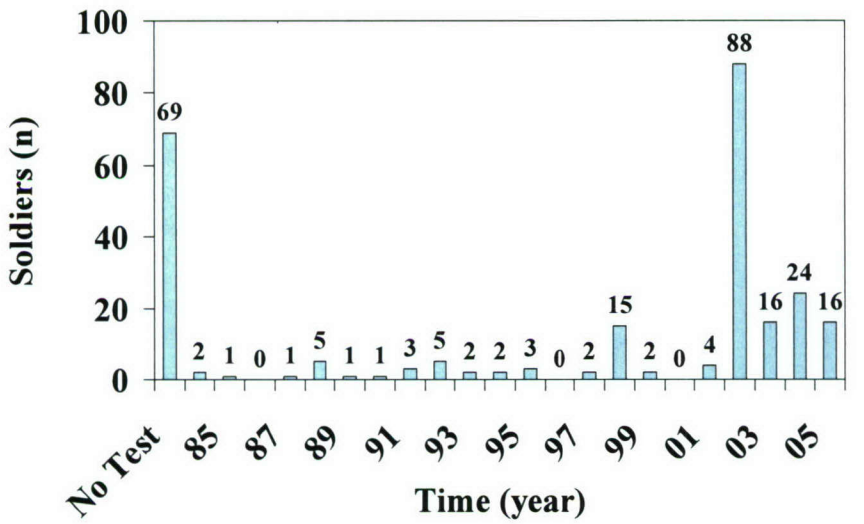
c. Defense Occupational and Environmental Health Readiness System -Hearing Conservation (DOEHRS-HC) and Sound Level Monitoring Data.

(1) The most recent hearing test on each band member from the DOEHRS-HC database is plotted in Figure 4. Sixty-nine band members (26%) did not have an audiometric record in the DOEHRS-HC and 118 (45%) had no test after 2001. Only 18 individuals (7%) were in compliance with annual hearing testing requirements. The absence of annual testing on Band members precluded any analysis of trends over time. The lack of timeliness also disallowed any attempts to portray current hearing status.

(2) Three individuals were found with calculated H3 profiles and seven with calculated H2 profiles (see Appendix G for a description of profile types). However, many of the tests in the DOEHRS-HC database were so old (up to 26 years) they cannot be considered valid representations of current hearing levels.

(3) Participants in the sound monitoring of the Herald Trumpets included 13 trumpet players and 3 percussionists (2 drum players, one timpani and cymbal player). No musician was wearing hearing protection. The ambient noise level in the rehearsal hall was between 58.0 and 62.0 dBA. During the warm-up session, the steady-state sound levels ranged between 91.6 dBA and 99.1 dBA. During the actual rehearsal, the steady-state sound levels ranged from 95.1 dBA and 98.4 dBA. The highest sound levels were generated in the center of the 13 trumpets (arranged in a semicircle). Steady-state sound levels measured in front of the Herald trumpets ranged between 100.0 dBA and 105.5 dBA (at a distance of 5 feet) and 101.1 dBA and 102.4 dBA (at a distance of 10 feet). Steady-state sound measurements at the conductor's position (approximately 37 feet from the trumpets) ranged between 91.9 and 97.1 dBA. A description of the rehearsal is at Appendix E.

Figure 4. Most Recent Hearing Conservation Test in Data Repository for 264 US Amy Band Members



d. Focus Group Interviews.

(1) Of the 63 individuals selected for the focus group interviews, there were 6 individuals on leave and 2 individuals who did not attend because of illness on the scheduled interview day. For individuals on leave, attempts were made to substitute individuals of the same gender, unit, and instrument or activity. In 5 cases, this was successful (2 instrumentalists, 2 vocalists, and one support person involved in staging). For the other 3 individuals, a female violinist was replaced with a female cellist, a female viola player was replaced with a female violin player, and the one string player in the chorale was replaced with a male vocalist.

(2) Table 27 shows the self-reported risk factors for injury, pain, or discomfort brought up by the Band members in each focus group. Table 28 shows ideas for reducing risk suggested by the Band members. Some suggestions in Table 28 were not practical or advisable but were included for completeness. The upper rows of Tables 27 and 28 contain risk factors and suggestions for reducing risk that were discussed by more than one focus group; the lower parts of the Tables contains risk factors and suggestions for reducing risk discussed by only one unit (labeled "Unit-Specific" in the first column). Note that there were two focus groups conducted for the ceremonial, concert and support interview groups and thus the double marking in this column. Numbers of risk factors mentioned for each unit are at the bottom of Table 27.

Table 27. Risk Factors for Injury, Pain or Discomfort from the Focus Group Interviews (a mark in the cell indicates which focus group discussed the factor; two marks in a cell indicate that both focus groups mentioned the factor {Ceremonial, Concert, Support Groups only})

Factor Grouping	Factor	Unit							
		Blues	Ceremonial	Chorale	Chorus	Concert	Strings	Support	Vol[a]
Shoes	Current shoes - little or no support, uncomfortable, hot	X	X X	X		X X			X
	Problems getting shoes replaced		X			X			
Uniform	High collars on clothing		X X	X			X		
	Clothing not matched to environment/playing style	X	X X			X			X
Activity Volume or Type	Long playing/work duration (hrs/day)	X	X X			X		X	
	Long playing/work frequency (days/wk); repetitive exposure		X X		X	X		X	X
	Standing for long periods of time in static postures		X X		X	X			X
	Long waiting time for events		X			X			
Terrain/ Environment	Standing/marching on uneven terrain (potholes)	X	X X						
	Marble surface at Tomb of the Unknowns (hot/hard)		X			X			
	Cold environments		X			X			X
	Hot environments/sun exposure/lack of sunglasses		X X			X		X	X
	Adverse weather (darkness, lightning)	X						X	
	Repetitive exposure to environment		X						X

Factor Grouping	Factor	Unit							
		Blues	Ceremonial		Chorale	Chorus	Concert	Strings	Support	Vol[a]
Instrument/ Equipment	Weight of instrument		X	X			X		X	X
	Lifting equipment (weight, size, shape)	X							X X	X
	Prolonged holding of music notebook				X	X				
Physical Training	Physical training (too much)	X	X		X	X	X	X		
	Preparation for APFT	X		X			X	X	X	
Other	Lack of manpower				X				X	
	Older age		X							X
	Difficulty in getting referrals for specialty health care			X						X
	Less cooperation/rotation - ceremonial and concert Bands		X	X						X
	Inadequate chairs						X	X		
Unit-Specific	Drums limit field of vision	X								
	Long sitting periods at piano	X								
	Physical training (too little time)			X						
	Difficulty hydrating during ceremony		X							
	Avoiding sick call because others would have to substitute		X	X						
	Difficulty getting appointments at clinic			X						
	Holding instrument when not playing		X							
	High intensity play for drummer		X							
	Cold weather hats allow glare on sunny days			X						

Factor Grouping	Factor	Unit							
		Blues	Ceremonial	Chorale	Chorus	Concert	Strings	Support	Vol[a]
	Gloves without lining in cold weather		X						
	Eye strain on sunny days		X X						
	Jitterbugging, throwing partner			X					
	Insufficient recovery time			X					
	Poorly lit stages			X					
	Spirit of America concert								
	Proximity of travel too close to performance				X				
	Off duty performances				X				
	Vocally demanding pieces				X				
	Lack of warm-up					X			
	Poor othrotics					X			
	Blouse does not allow natural play of instrument					X			
	Improper holding of instrument					X			
	Unnecessary rehearsals					X			
	Playing posture, especially upper stringed instruments						X		
	Lack of breaks						X		
	Playing through discomfort to complete mission						X		
	Deadlines							X	
	Large size of cases/instruments							X	
	Driving (traffic in DC, long hours)							X X	
	Limited set-up time							X	

Factor Grouping	Factor	Unit							
		Blues	Ceremonial	Chorale	Chorus	Concert	Strings	Support	Vol[a]
	Cyclic missions (rush periods followed by slack periods)							X	
	Location of site (long way to transport equipment)							X	
	Environmental exposures (allergens, smoke)								X
	Risk Factors Reported (n)	10	28	8	7	19	7	14	13

[a]Volunteer Group

Table 28. Suggested Methods of Reducing Injuries/Pain/Discomfort (a mark in the cell indicates which focus group discussed the factor; two marks in a cell indicate that both focus groups mentioned the factor {Ceremonial, Concert and Support Groups only})

	Suggestion	Group							
		Blues	Ceremonial	Chorale	Chorus	Con-cert	Strings	Sup-port	Vol[a]
Shoes	Replace shoes (more cushioning, slip resistant)	X	X X			X X			
	Obtain shoes specifically designed for dancing			X					X
Uniform	Modify uniforms for summer wear		X						X
	Modify collar on uniform (no collar, removable)		X	X		X	X		
	Lighter colored clothing for hot environments (cool, UV protection)	X	X X			X			X
	Modify hats (to reduce glare, ear covers for winter)		X						X
Activity Volume or Type	Adequate rest/breaks between performances				X	X	X	X	
	Reduce number of performances				X			X	
	Allow sitting when playing		X						X
Terrain	Pre select area for Band to be located to avoid uneven terrain		X						
	Notify by cell phones when ready for event to avoid prolong standing		X						
Instrmnt/ Eqpmnt	Decrease weight of instruments		X						X
	Redesign slings for drummers		X			X			
	Special holders for instruments/music books	X	X		X				
	Back belts	X						X	
Orthotics	Orthotics designed for prolonged standing		X X		X	X		X	
	Streamline procedure for obtaining orthotics		X						X
Other	Earlier intervention for injuries, podiatry and physical therapy		X			X			X
	Alexander/Feldenkrais Technique		X	X	X	X	X		
	Wellness/injury prevention education instruction		X						X
	Use risers with maximum independent space				X				X
Unit-Specific	Monitor weather to avoid severe storms	X							
	Antifatigue buttock pad	X							
	Patch roadways	X							
	Harnesses to reduce instrument weight	X							
	Shorter ceremonies in hot or cold environments		X						
	Opportunities for hydration/prehydration in hot environments		X						
	Sun glasses		X			X			

	Suggestion	Group							
		Blues	Ceremonial	Chorale	Chorus	Con-cert	Strings	Sup-port	Vol[a]
	Gloves that allow playing in cold weather		X						
	Chiropractic manipulation for low back pain		X						
	Rotate to less physically demanding jobs (concert)		X X						
	Anti-inflammatory medication		X						
	Glucosamine		X						
	Rotate band members, 2 weeks indoor, 2 weeks outdoor		X						
	Have concert Band fill in when required for particular instruments		X						
	Better link to ENT			X					
	Vocal training/vocal conservation				X				
	Back exercises				X				
	Sing down 1 octave				X				
	Add monitor so performance can be heard				X				
	Reduce unnecessary marching rehearsals					X			
	Instruction on orthotics and foot care issues					X			
	Posture training					X			
	Running training					X			
	Formal written tips from others on how to avoid injury					X			
	Regular massage						X		
	Pilates						X		
	Stretching						X		
	Larger stages						X		
	Equipment gator with trailer							X	
	Lip on truck tailgates							X	
	Rails on trucks for sliding out equipment							X	
	Shorts for summer							X	
	Assign more people to reduce workload							X	
	Contract younger personnel for missions							X	
	Have Old Guard assist with loading							X	

	Suggestion	Group							
		Blues	**Ceremonial**	**Chorale**	**Chorus**	**Con-cert**	**Strings**	**Sup-port**	**Vol[a]**
	Musicians help with set-up							X	
	Require loading/off loading be within a specified distance of truck							X	
	Band physical therapist								X

[a]Volunteer Group

(3) Major perceived concerns had to do with shoes, clothing, activity volume, terrain and environment, instruments and equipment, and physical training. Most groups mentioned problems with the current footwear. Interviewed members considered the current footwear to be inflexible when walking, poorly designed for prolonged standing, and, in some cases lacking in lateral support or arch support. Shoes were cited as lacking "breathability" (venting sweat and heat) and it was commented that the dark color made them very uncomfortable in hot weather. Women's shoes were also noted to provide little support and to feel unstable ("wiggle") when Soldiers were walking. Soldiers suggested that flexible, vented shoes designed for prolonged standing be obtained and used. Chorale Soldiers specifically noted that the current low quarter shoes provided little support for the dancing movements they performed and could be slippery during performances. Chorale members sometimes perform dances in combat boots and they noted that this boot is very constrictive. They suggested that a mesh boot (e.g., the old jungle boot) might allow a greater range of motion with adequate support. Chorale Soldiers also mentioned that appropriate dancing shoes were available in retail stores.

(4) Uniforms (other than shoes) were another major issue. Clothing was cited as not being matched to the environmental conditions. The wool uniforms could be very hot in the summer resulting in early discomfort and fatigue during performances. The high collars were mentioned a number of times as adding to discomfort especially if they were too high for the individual. Collars were also cited as limiting the neck range of motion and interfering with the playing of some instruments. Other uniform problems mentioned by Soldiers included the cold weather gloves that made playing difficult, blouses that restricted playing motions, and cold weather hats without brims that could result in glare on sunny days. Soldiers suggested that summer uniforms (potentially of sweat wicking material like polyester, rayon, or polyproprolene) might be designed. Removable collars were also cited as a possibility (potentially designed to allow for different sizes). Bills on winter hats were suggested to reduce sun glare as were gloves that allow for playing in cold weather. The need for sun glasses was cited strongly by several people as they reduce glare and provide eye protection from ultraviolet light. Sunglasses were apparently used at one time but are now prohibited.

(5) Many Band members cited the amount of playing as a risk factor. The frequency (times per week) and duration (time per session) were both cited as contributing to the total amount of playing. It was noted that the number of performances had increased over the years without any increase in personnel. With increased performances had come increased rehearsals and more prolonged standing, especially for the Ceremonial unit. The pain and discomfort from prolonged standing were cited by many Soldiers interviewed. A long period of sitting was mentioned as being uncomfortable by a piano player. Reducing the number of performances and unnecessary rehearsals was suggested. Providing more rest breaks during long performances was suggested. It was noted that sitting down during certain ceremonies (as the Navy does) could help reduce the pain and discomfort from prolonged standing. Orthotics were mentioned several times as possibly assisting with providing comfort during prolonged standing;

streamlining the procedure for obtaining orthotics through the medical system was requested. Also, buttock pads specifically designed for musicians could assist in reducing discomfort from prolonged sitting.

(6) Problems with terrain and environment included standing and/or marching on uneven ground and hard surfaces, exposure to hot and cold environments, playing in adverse weather conditions, heat and glare off the marble at the Tomb of the Unknowns, and repetitive exposure to inclement weather. While many of these risks were seen as unavoidable, some suggestions were provided. Senior personnel (or a retired drum major) could preselect more even ground for particular ceremonies to reduce risks from uneven terrain. Patching roadways would help. Better weather monitoring and shorter ceremonies in adverse weather conditions were suggested. Semiweekly rotations of Band members between indoor and outdoor performances were suggested. Increasing opportunities for hydration during long ceremonies and prehydration (drinking fluids prior to event) were cited as helpful.

(7) Problems with instruments were fewer than expected but several potential risks were noted. The heavy weight of some instruments (especially sousaphones, tubas, and saxophones) was cited. Problems with drums limiting the field of vision while marching and long periods of sitting at the piano were mentioned. The Chorus and Chorale both mentioned prolonged holding of music notebooks. To alleviate some of these problems, the use of harnesses to support some of the weight the instrument weight was mentioned, as well as redesigning slings for drummers. It was mentioned that fiberglass sousaphones were being obtained to reduce weight. Back belts were mentioned several times but these have generally not been shown to be effective (76-78).

(8) The support group differed from the instrumentalists in their mission. They cited no problems with shoes or uniforms, probably because they had already customized the uniform and shoes to their activities. They did cite as potential risk factors the high number of missions, adverse weather, and especially equipment size and weight. In addition, they cited a lack of manpower (too few Soldiers) and their age as risk factors. Long drives and driving in DC traffic were cited as risk factors as were the long distances between truck off loading locations and set-up locations. The cyclic nature of mission loads (i.e., periods of intense activity followed by slack periods) was cited as a risk because of "deconditioning." Limited set-up time could result in too much hurry and possibly result in injury.

(9) To reduce these risks additional manpower was the major suggestion from the support group. They also suggested 1) obtaining an equipment "gator" with a trailer to move equipment to sites long distances from the truck, 2) adding sliding rails on the equipment truck to assist with off loading, 3) adding lips on the loading ramps to prevent items from sliding off while the off-loading ramp is moving up or down, and 4) instituting a policy that loading/off loading be performed a specific distance from the truck.

(10) One of the questions on the interviews involved hearing (Appendix C). Virtually all Band members and members of the support group were concerned about hearing loss as a result of their work in the Band. The question elicited additional responses as shown in Table 29. Few Band members reported using hearing protection. The Ceremonial group was particularly concerned with their proximity to the Old guard when those Soldiers were firing their weapons. Potential hazards from the constant noise exposure were cited by the concert and chorus units. The major suggestions for reducing risk were better use of acoustic shields and regular hearing tests to detect hearing problems.

Table 29. Hearing Issues Discussed and Ways of Reducing Hearing Loss Suggested (two marks in a box indicate that both focus groups mentioned the particular factor for {Ceremonial and Concert Groups only})

Hearing Issues and Ways of Reducing Hearing Risk	Group						
	Blues	Ceremonial	Chorale	Chorus	Concert	Strings	Supp
Hearing Issues							
Proximity to Old Guard firing		X X					
Double charged rounds		X					
Location of instruments		X					
Infrequent hearing testing		X					
Singing with concert band and loud performances				X			
Practice Rooms and rehearsal halls too small – loud					X		
Style of music changed and has become louder over time			X				
Moving and offloading equipment							X
Constant noise exposure, especially in front of trumpets				X	X		
Blues and percussion noise							
Ways of Reducing Hearing Risk							
Reduce proximity to Old Guard firing		X					
Better use of acoustic shields				X	X	X	
Inform people who play too loudly						X	
Regular hearing tests					X		
Alternate hearing protection in ears					X		

[a]Volunteer Group

e. Questionnaire Data. Table 30 shows the number and proportion of returned questionnaires by questionnaire type. The overall return was 92% (243/264). The instrumentalists returned the greatest proportion of their questionnaires and the conductors returned the least. Most of the questions were similar for all four questionnaire types as shown in Appendix D. There were slight variations to make the questions more applicable to a particular group (e.g., referring to "playing" for instrumentalists and "singing" for vocalists). Some questions were unique to a particular type of questionnaire (e.g., first question for instrumentalists regarding the length of time they had been playing their musical instrument). The questions that were similar are discussed first (in order of appearance on the questionnaire) and the questions unique to the different groups are discussed later.

Table 30. Distribution of Questionnaires by Type

Type of Questionnaire	Questionnaires Returned		Group Size	
	N	Proportion of All (n=243) Returned Questionnaires (%)	N	Proportion of Group Returning Questionnaires (%)
Instrumentalists	176	72.4	178	98.8
Vocalists	35	14.4	45	77.8
Support	30	12.3	35	85.7
Conductors	2	0.8	5[a]	40.0

[a]Excludes Commander who did not receive a questionnaire

(1) Shoes and Uniforms.

(a) Table 31 shows responses to the questions on problems with shoes and uniforms. Over half of the Soldiers noted that they had problems with both the shoes and the uniforms.

Table 31. Responses to Shoes and Uniforms Questions

	Yes (problems)		No (problems)		No Response	
	N	Proportion (%)	N	Proportion (%)	N	Proportion (%)
Shoe Problems	122	50.2	108	44.4	13	5.3
Uniform Problems	122	50.2	105	43.2	16	6.6

(b) Table 32 shows the shoe and uniform problems by unit. The ceremonial and chorale units had 75% or more of Soldiers reporting shoe problems; the chorus and concert groups had 50% or more of their units reporting shoe problems. With regard to uniforms, the ceremonial, chorale, and string units had 75% or more reporting problems; about half of the concert unit reported uniform problems. The support group had few complaints about either shoes or uniforms.

Table 32. Shoe and Uniform Problems by Unit

Unit	Shoe Problems				Uniform Problems			
	Yes		No		Yes		No	
	N	Proportion (%)	N	Proportion (%)	N	Proportion (%)	N	Proportion (%)
Blues	5	29.4	12	70.6	5	29.4	12	70.6
Ceremonial	53	81.5	12	18.5	49	75.4	16	24.6
Chorale	9	75.0	3	25.0	9	75.0	3	25.0
Chorus	15	53.6	13	46.4	8	28.6	20	71.4
Concert	33	50.0	33	50.0	32	49.2	33	50.8
Strings	6	28.6	15	71.4	17	81.0	4	19.0
Support	1	5.3	18	94.7	1	5.9	16	94.1
Officers	0	0	2	100.0	1	50.0	1	50.0

(c) Table 33 contains a summary of the 172 shoe problems cited in the opened ended question on this topic. One individual could have cited more than 1 problem and all comments were included. The major reported problem was that the shoes caused pain and discomfort and, in some cases, were assumed to be associated with some specific injuries. Some individuals cited "difficulty" or "unsuitability" during walking or standing but these comments appeared to be related to discomfort and pain during these activities. The shoes were cited as lacking in general support, in arch support, in cushioning, and in flexibility. They were considered too hot in warm weather and poorly designed for prolonged standing and marching.

Table 33. Summary of Responses to Open-Ended Question on Shoe Problems

Problem	Comments Each (n)	Total Comments for Problem Group (n)
Activity Problems		31
Walking/Marching	17	
Standing	11	
Dancing (need straps, boots inadequate)	3	
Medical		37
General Pain/numbness	28	
Back Problems	1	
Plantar Fasciitis	3	
Flat feet	2	
Blisters	2	
Hip/Knee	1	
Comfort Problems		70
General (uncomfortable)	9	
Too hot	9	
Too cold	2	
Sweating	4	
Lacks cushioning	8	
Lacks support	21	
Lacks flexibility	8	
Arch support	9	
Construction Problems		29
General fitting problems	7	
Too wide	1	
Too narrow	4	
Sole problems	8	
Uppers problems	2	
Need straps	4	
General quality	3	
Other Problems		5
Orthotics	4	
Difficulty with instrument	1	

(d) Table 34 contains a summary of the 146 uniform problem cited in the open-ended question on this topic. By far, the major complaint had to do with perceiving the uniform as being too hot and lacking in breathability in hot environments. A second major problem had to do with the collars. Often this was a vague complaint (e.g., the uniform problem was cited simply as "collar" or "collar uncomfortable") but specific complains were also cited (e.g., changing the orientation of the instrument, chaffing, pain or tension). Other (related) problems had to do with the restrictive nature of the uniform that could limit some freedom of movement, skirts that made walking or dancing difficult, and buttons and medals that scratched or rattled against instruments.

Table 34. Summary of Responses to Open-Ended Question on Uniform Problems

Problem	Comments Each (n)	Total Comments for Groups (n)
Too Hot	55	68
Coat	1	
Sleeves	1	
Venting/breathing	11	
Collar	24	39
Changes Instrument Orientation		
Strings	4	
Brass	2	
Drums	1	
Chaffing	1	
Pain	3	
Causes Tension	1	
Changes Posture	1	
Difficulty singing	2	
Restrictive	4	15
Chest	2	
Arms	4	
Shoulder	5	
Skirts difficult for walking/dancing	6	6
Buttons/Medals		5
Scratch Instrument	3	
Rattle on Instrument	2	
Other	1	13
Size	1	
Rain Coat Needed	1	
Pockets stick out	1	
Winter gloves too cold	2	
Generally cold	1	
Maternity	1	
Blue color	1	
Headgear	1	
Lack of Sunglasses	1	
Bad design for Cello	1	
Plastic works its way out	1	

(2) Physical Activity.

(a) Table 35 shows responses to the questions regarding the frequency and duration of physical activity. For aerobic activity, 71% (173/243) responded that they exercised at least three days per week and 76% (185/243) responded that they exercised over 30 minutes each time. For strength activity, 72% (174/243) said they exercised at least twice a week and 49% (120/243) said they exercised over 30 minutes each time. For sports activity, 26% (62/243) responded that they performed sports at least twice a week and 49% (120/243) said they participated over 30 minutes each time. For other activity, 70% (169/243) responded that they were active at least twice a week and 87% (211/243) said they were active for over 30 minutes each time.

Table 35. Responses to the Exercise, Sports and Other Activity Frequency and Duration Questions

Category of Question	Response Category	Aerobic Activity		Strength Activity		Sports Activity		Other Activity	
		N	Proportion of Soldiers (%)	N	Proportion of Soldiers (%)	N	Proportion of Soldiers (%)	N	Proportion of Soldiers (%)
Frequency of Activity	None	4	1.6	12	4.9	102	42.0	9	3.7
	<1 day/wk	8	3.3	26	10.7	48	19.8	22	9.1
	1 day/wk	10	4.1	31	12.8	31	12.8	40	16.5
	2 days/wk	48	19.8	53	21.8	23	9.5	48	19.8
	3 days/wk	91	37.4	72	29.6	14	5.8	60	24.7
	4 days/wk	36	14.8	25	10.3	5	2.1	20	8.2
	5 days/wk	23	9.5	15	6.2	11	4.5	20	8.2
	6 days/wk	17	7.0	7	2.9	5	2.1	7	2.9
	7 days/wk	6	2.5	2	0.8	4	1.6	14	5.8
	No Response	0	0	0	0	0	0	3	1.2
Duration of Activity	None	4	1.6	12	4.9	99	40.7	8	3.3
	<15 min	4	1.6	32	13.2	6	2.5	8	3.3
	16-30 min	50	20.6	79	32.5	16	6.6	12	4.9
	31-45 min	103	42.4	67	27.6	28	11.5	21	8.6
	46-60 min	55	22.6	31	12.8	31	12.8	66	27.2
	>60 min	27	11.1	22	9.1	61	25.1	124	51.0
	No Response	0	0	0	0	2	0.8	4	1.6

(b) As described in the Data Analysis section and in Appendix H, the frequencies and durations were used to calculate the approximate amount of weekly time performing each type of physical activity. The estimated mean±SD times spent in aerobic activity, strength training, sports, and other activity were 177±106 min/wk, 119±103 min/wk, 62±101 min/wk, and 369±416 min/wk, respectively. These statistics included Soldiers who reported no activity (i.e., 0 min).

(c) Table 36 shows responses to the question on overall physical activity. Those reported themselves as much more active or somewhat more active than others of their age and sex comprised 65% (158/243) of the group. Only 9% (21/243) considered themselves somewhat less active or much less active.

Table 36. Responses to the Question on Overall Physical Activity on the Exercise and Sports Questionnaire

Response Category	N	Proportion of Soldiers (%)
Much More Active	60	24.7
Somewhat More Active	98	40.3
About the Same	61	25.1
Somewhat Less Active	19	7.8
Much Less Active	2	0.8
No Response	3	1.2

(3) Tobacco Use. Table 37 shows the responses to the smoking and smokeless tobacco questions. The large majority of Soldiers had never been smokers or smokeless tobacco users. Only about 7% (16/243) of the Soldiers reported being current smokers and less than 1% (2/243) reported being current smokeless tobacco users. Former cigarette smokers that had quit comprised 10% (23/243) of the group and former smokeless tobacco users that had quit comprised less than 1% (2/243) of the group.

Table 37. Responses to the Smoking and Smokeless Tobacco Questions

Smoking			Smokeless Tobacco		
Response Category	N	Proportion (%)	Response Category	N	Proportion (%)
Never Smoked	202	83.1	Never Used	233	95.9
Smoke 10 or fewer cigs/day	0	0	Use $\leq$ 1 time/day	0	0
Smoked <11 cigs/day	12	4.9	Use 2-4 times/day	2	0.8
Smoked 11-20 cigs/day	4	1.6	Use 5-10 times/day	0	0
Smoke >20 cigs/day	0	0	Use >10 times/day	0	0
Quit <6 months ago	3	1.2	Quit <6 months ago	0	0
Quit 6 months to 1 year ago	0	0	Quit 6 months to 1 year ago	0	0
Quit >1 year ago	20	8.2	Quit >1 year ago	2	0.8
No Response	2	0.8	No Response	6	2.5

(4) Medical Problems and Medical Care.

(a) There were 64% (143/224) of the Soldiers reporting that they currently experienced pain, soreness, discomfort, weakness, numbness or tingling while working (referred to hereafter as musculoskeletal symptoms). There were 19 Soldiers who did not respond to this question and the denominator includes only those who did respond. Soldiers were asked about problems in as

many as three body areas and Table 38 shows the number and proportion of Soldiers responding. Almost half reported musculoskeletal symptoms in at least two body areas but only about ¼ reported musculoskeletal symptoms in a third body area. Overall symptoms intensity on the 10 point scale (mean±SD) was 5.0±1.8 for the area with the most symptoms and 4.2±1.7 for the second area with symptoms.

Table 38. Current Musculoskeletal Symptoms While Working

	Yes (symptoms)		No (no symptoms)		No Response	
	N	Proportion (%)	N	Proportion (%)	N	Proportion (%)
Area with Most Symptoms	143	58.8	81	33.3	19	7.8
Other Area with Symptoms	116	47.7	108	44.4	19	7.8
Third Area with Symptoms	63	25.9	161	66.3	19	7.8

(b) Table 39 shows the reported anatomical locations of current musculoskeletal symptoms while working. The low back, foot, and shoulders had the highest symptoms prevalence for both the area with the most symptoms and the other area with symptoms. In the areas with the most symptoms, the upper body was involved in 41% of the cases (59/143) and the lower body in 38% (55/143); in the "other area with symptoms" the upper body was involved in 41% (48/116) of the cases and the lower body in 26% (30/116).

Table 39. Anatomical Areas of Musculoskeletal Symptoms

Body Area	Anatomic Location	Area with Most Symptoms (n=143)		Other Area with Symptoms (n=116)	
		N	Proportion (%)	N	Proportion (%)
Upper Body	Mouth (jaw)	9	6.3	1	0.9
	Head	1	0.7	1	0.9
	Neck	9	6.3	11	9.5
	Shoulder	12	8.4	13	11.2
	Arms	3	2.1	5	4.3
	Elbow/Wrist	7	4.9	8	6.9
	Hand	11	7.7	6	5.2
	Finger	4	2.8	1	0.9
	Upper Back	3	2.1	2	1.7
	Lower Back	23	16.1	33	28.4
Lower Body	Hips	1	0.7	1	0.9
	Thighs	2	1.4	0	0
	Lower Leg	4	2.8	3	2.6
	Knee	5	3.5	9	7.8
	Ankle	0	0	1	0.9
	Foot	42	29.4	15	12.9
	Toes	1	0.7	1	0.9
Other		4	2.8	4	3.4
Multiple		2	1.4	1	0.9

(c) Table 40 shows the frequency of reported problems limiting daily activity by anatomical location. The anatomic locations listed in descending order of response frequency. The most frequently reported locations with problems limiting daily activity were the back, foot, knee and shoulder. In all cases except for dental, over half of the problems were reported to be associated with Band activity. In order of frequency, foot, hand, shoulder, wrist, and neck problems had the most frequently reported association with Band activity.

Table 40. Problems Limiting Daily Activity by Anatomical Location

Anatomic Location	Problems Limiting Daily Activity						Caused by Band Activity					
	Yes		No		No Response		Yes		No		Unsure	
	N	Proportion of Band (%)	N	Proportion of Band (%)	N	Proportion of Band (%)	N	Proportion of Anatomic Location (%)	N	Proportion of Anatomic Location (%)	N	Proportion of Anatomic Location (%)
Back	144	59.3	96	39.5	3	1.2	88	61.1	15	10.4	41	28.5
Foot	122	50.2	119	49.0	2	0.8	90	73.8	11	9.0	21	17.2
Knee	91	37.4	151	62.1	1	0.4	48	52.7	15	16.5	28	30.8
Shoulder	85	35.0	157	64.6	1	0.4	57	67.1	9	10.6	19	22.4
Neck	66	27.2	176	72.4	1	0.4	43	65.2	10	15.2	13	19.7
Wrist	54	22.2	187	77.0	2	0.8	36	66.7	7	13.0	11	20.4
Hand	51	21.0	190	78.2	2	0.8	37	72.5	5	9.8	9	17.6
Dental	27	11.1	215	88.5	1	0.4	10	37.0	9	33.3	8	29.6
Vocal	19	7.8	223	91.8	1	0.4	10	52.6	6	31.6	3	15.8

(d) There were 90 Soldiers (37%) who reported that they had an injury related to their duty assignments in 2005. One-hundred forty-one Soldiers (58%) reported no injury and 12 (5%) did not respond to the question. Table 41 shows the reported anatomic locations and the injuries involving profiles. The table is ordered from the most often reported anatomic location to the least often reported. There were a total of 213 injuries cited with 16% (33/213) resulting in profiles. The low back, foot, and shoulder and wrist were the most commonly reported injury and profile sites.

Table 41. Anatomic Locations of Duty-Related Injuries in 2005 and Proportion of Injuries Involving Profiles

Anatomic Location	Injury						Injuries Involving Profiles	
	Yes		No		No Response			
	N	Proportion of Band (%)	N	Proportion of Band (%)	N	Proportion of Band (%)	N	Proportion of Anatomic Location(%)
Lower Back	34	14.0	208	85.6	1	0.4	5	14.7
Foot	26	10.7	216	88.9	1	0.4	4	15.4
Shoulder	22	9.1	220	90.5	1	0.4	4	18.2
Wrist	17	7.0	225	92.6	1	0.4	3	17.6
Neck	16	6.6	226	93.0	1	0.4	1	6.3
Hand	14	5.8	228	93.8	1	0.4	2	14.3
Knee	13	5.3	229	94.2	1	0.4	1	7.7
Teeth/Jaw	11	4.5	231	95.1	1	0.4	2	18.2
Ankle	8	3.3	234	96.3	1	0.4	2	25.0
Hip	8	3.3	234	96.3	1	0.4	1	12.5
Finger	8	3.3	234	96.3	1	0.4	2	25.0
Upper Back	8	3.3	234	96.3	1	0.4	1	12.5
Lower Arm	7	2.9	234	96.3	2	0.8	0	0
Vocal	6	2.5	236	97.1	1	0.4	3	50.0
Upper Arm	4	1.6	238	97.9	1	0.4	1	25.0
Toe	3	1.2	239	98.4	1	0.4	1	33.3
Calf/Shin	3	1.2	239	98.4	1	0.4	0	0
Head	3	1.2	239	98.4	1	0.4	0	0
Chest	2	0.8	240	98.8	1	0.4	0	0
Thigh	0	0	242	99.6	1	0.4	0	0

(e) Table 42 contains a summary of the self-reported changes Soldiers made to reduce musculoskeletal symptoms. There were a total of 76 Soldiers who made 103 comments (a respondent could have cited more than one change). Individuals primarily made physical adjustments such as altering body positions, shifting their body weight, or shifting the weight of their musical instrument to reduce the amount of stress on the body regions with musculoskeletal symptoms. Band members also used wellness techniques (e.g., relaxation, stretching) and altered their practice, rehearsal and performance techniques. It is notable that instrumentalists and vocalists responded that they adjusted their playing or singing intensity and "marked" high notes to avoid aggravating musculoskeletal symptoms.

Table 42. Summary of Changes due to Musculoskeletal Symptoms

Problem	Each (n)	Total for Major Category (n)
Physical Position/Movement		64
Adjust body position	19	
Shift weight distribution on legs	7	
Hold instrument/music in other hand (while resting)	7	
Hold instrument differently	20	
Brace/rest instrument on leg or chair	3	
Brace elbow against body	1	
Change/add/remove neck strap	6	
Minimize motion	1	
Technique		17
Get assistance lifting objects (support group)	2	
Mark high notes/play down 1 octave (vocalists)	5	
Less intense (softer) playing/singing	6	
Breathe more	2	
Pacing	2	
General Adjustments		9
Use seat cushion	1	
Shake out hand	1	
Adjust instrument set-up (chin/shoulder rests, mouthpiece)	3	
Make adjustments as appropriate	4	
Wellness		15
Relax	5	
Stop/rest	4	
Take short, frequent breaks	3	
Stretching	3	

(f) Table 43 shows where Soldiers reported obtaining their medical care. Over ½ of the Soldiers used Rader Health Clinic located at Ft Myer, VA. Most Soldiers (85%, 207/243) reported the exclusive use of one facility with 14% (33/243) reporting the use of multiple facilities. Only one Soldier reported exclusive use of a civilian facility.

Table 43. Location of Medical Care

Type of Response	Location	N	Proportion (%)
Exclusive Responses	Rader Health Clinic	130	53.5
	Fairfax Family Health Center	16	6.6
	Woodbridge Family Health Center	15	6.2
	DeWitt Army Community Hospital	14	5.8
	Bethesda Naval Health Center	11	4.5
	Walter Reed Army Medical Center	10	4.1
	Kimbrough (Fort Meade)	6	2.5
	Malcolm Grow Medical Center (Andrews Air Force Base)	3	1.2
	DiLorenzo Medical Clinic (Pentagon)	1	0.4
	Exclusive Civilian	1	0.4
Multiple Responses	Multiple Military Facilities	27	11.1
	Civilian and Military Facilities	6	2.5
No Response		3	1.2

(g) Table 44 shows reported satisfaction with medical care. About 66% (160/243) of Soldiers were completely to reasonably satisfied with the medical care they received but about 12% (28/243) were moderately to extremely unsatisfied.

Table 44. Satisfaction with Medical Care

Response Category	N	Proportion (%)
Completely Satisfied	30	12.3
Reasonably Satisfied	130	53.5
Borderline	51	21.0
Moderately Unsatisfied	22	9.1
Extremely Unsatisfied	6	2.5
No Response	4	1.6

(h) Table 45 contains a summary of recommended job modifications cited in the open ended question. There were 152 respondents who made a total of 169 comments recommending at least one change to improve their job in the U.S. Army Band. Recommendations could be classified into six major categories. Although specific issues with shoes and uniforms were addressed in previous questions, many respondents cited them again. Changes to health care services were also mentioned frequently. Specifically, Band members would like easier access to specialty care such as physical therapy, massage therapy, and chiropractors in order to treat injuries and alleviate musculoskeletal symptoms incurred from their jobs in the Band. Some recommendations related to equipment were mentioned. Operational changes to the Band were

suggested most often, in particular the equalization of workloads for the Concert and Ceremonial Band elements. There were also a number of suggestions on reducing time standing and on allowing sitting or moving during ceremonies.

Table 45. Recommended Job Modifications

Problem	Each (n)	Total for Major Category (n)
Shoes		41
More comfortable/supportive	35	
Provide/update orthotics	6	
Uniform		25
Redesign for protection from heat/sun & insulation from cold	23	
Change collar	2	
Medical (more access/specialists, wellness)		23
More access to PT/massage therapy/chiropractor	19	
Preventive/wellness education and care	4	
Equipment	4	13
Ergonomic considerations/lightweight instrument design	7	
Better trucks/lift gates	2	
Operations		47
Equalize workload for ceremonial/concert sections	15	
Increase numbers in sections	3	
Regulate schedule (no extra rehearsals/last minute jobs)	5	
Physical Training		
Modify APFT events/follow PT profile	5	
Unit/individual PT during duty time/not before concert	5	
Modify schedule according to heat/cold advisory	5	
Schedule breaks during rehearsals/between performances	5	
Improve acoustics/atmospheric condition of rehearsal hall	4	
Miscellaneous		20
Reduce standing/allow sitting or movement during ceremonies	12	
Limit speech numbers/time during ceremonies	1	
Reduce amount of heavy lifting/carry distance (support group)	2	
Allow more setup time	1	
Modify marching step to accommodate shorter stride length	1	
Provide organizational awards/incentives for job performance	1	
Reduce volume during rehearsals/performances	2	

(5) Hearing.

(a) Table 46 shows responses from several hearing questions that involved yes or no answers. Over 2/3 of Soldiers had experienced ringing ears or a sensation of fullness in their ears from their Band activities. There were few Soldiers who reported regularly taking > 1 aspirin per day and even fewer who reported shooting skeet or frequenting pistol or rifle ranges. Almost 90% of Soldiers reported they would use hearing protection if it also enhanced their ability to hear others and monitor their own performance.

Table 46. Responses to Several Hearing Questions

Question	Yes		No		No Response	
	N	Proportion (%)	N	Proportion (%)	N	Proportion (%)
Ringing/fullness in ears after performance	164	67.5	74	30.5	5	2.1
Take >1 Aspirin/Day Fairly Regularly	22	9.1	217	89.3	4	1.6
Shoot skeet or frequent pistol or rifle range	13	5.3	227	93.4	3	1.2
Would use enhanced hearing protection	216	88.9	16	6.6	11	4.5

(b) Table 47 shows the responses to the questions regarding hearing protection during practice, rehearsal and performance. Very few Soldiers reported "always" wearing protection (<6%). Over half the Soldiers "sometimes" wore protection in rehearsal and performance and less than half "sometimes" wore protection in practice sessions. Over 30% reported "never" wearing hearing protection.

Table 47. Use of Hearing Protection during Practice, Rehearsal, and Performance

	Never		Sometimes		Always		Not Applicable		No Response	
	N	Proportion (%)	N	Proportion (%)	N	Proportion (%)	N	Proportion (%)	N	Proportion (%)
Practice	102	42.0	104	42.8	6	2.5	30	12.3	1	0.4
Rehearsal	76	31.3	142	58.4	14	5.8	0	0	11	4.5
Performance	86	35.4	138	56.7	11	4.5	0	0	8	3.3

(c) Table 48 shows the reported levels of concern with hearing loss. Forty-two percent (101/243) of Soldiers reported they were extremely or very concerned with hearing loss. Nineteen percent (45/243) were a little concerned or not concerned.

Table.48. Concern With Hearing Loss

Response Category	N	Proportion (%)
Extremely Concerned	49	20.1
Very Concerned	52	21.4
Somewhat Concerned	96	39.5
A Little Concerned	27	11.1
Not Concerned	18	7.4
No Response	1	0.4

(d) Table 49 shows responses to multiple part questions that asked Soldiers to check any or all of 4 statements that they regarded as true. Few Soldiers thought any of the statements were true but the statement with the highest number of positive responses was the one erroneously stating "distorted music is more hazardous to your hearing than well played music at the same loudness level".

Table 49. Responses to Various Statements Regarding Hearing

Response Category	Positive Responses (N)	Proportion (%)
Distorted music is more hazardous than well-played music	49	20.2
Listening to music through headphones is less hazardous	24	9.9
Hearing loss can be permanent	22	9.1
New developments can totally restore hearing	10	4.1

(e) Table 50 shows responses to the questions regarding problems the Soldiers had with hearing protection. Problems with "monitoring performance "(self or others) elicited positive responses from over 3/4 of the Soldiers. "Uncomfortable" and "distorts sound" elicited positive responses from about ¼ of the Soldiers.

Table 50. Hearing Protection Problems

Response Category	Positive Responses (N)	Proportion (%)
Interferes with ability to monitor own performance	201	82.7
Interferes with ability to monitor others' performance	176	72.4
Uncomfortable	70	28.8
Distorts sound	63	25.9
Not available for Band members	8	3.3
Do not work	7	2.9
No problems	25	10.3

(f) Table 51 shows the responses to the question that asked Soldiers to indicate the statement they agreed with most. By far, Soldiers most agreed that they valued their hearing as their most precious learning and hearing resource. About ¼ of the Soldiers reported that they had to accept a certain amount of hearing loss as unavoidable.

Table 51. Statements Most Agree With

Response Category	N	Proportion (%)
Will lose hearing in old age regardless of what we do	0	0
I value hearing as precious learning and social resource	173	71.2
I accept hearing loss as unavoidable	57	23.5
No response	13	5.3

(6) Additional Comments. Table 52 shows the categorization of additional comments on the questionnaire. There were a total of 146 comments from 74 Soldiers. The largest number of comments had to do with uniforms, hearing protection, scheduling, standing time and injuries. Uniform concerns involved primarily shoes and heat problems. Many Soldiers noted that hearing protection was needed to avoid hearing loss but problems with hearing protection were also cited. Soldiers noted that rotations among the various Band units would be helpful. The need to reduce standing and marching time was reiterated. There were concerns about the fact that Soldiers had current job-related injuries or pain.

Table 52. Summary of Additional Questionnaire Comments

Problem	Each (n)	Total for Major Category (n)
Specialists/therapists/ergonomic support is needed for the Band	8	8
Hearing protection is needed for the Band		18
Hearing protection needed	5	
Might wear ear plugs depending on comfort of them	1	
Band should stand farther away from loud noises	1	
Hearing protection clogs ears/can't play with/work with	2	
Hearing loss is a major concern	1	
Band-provided molded to ear diaphragm ear plugs have helped preserve my hearing	1	
Always wear hearing protection at the range	1	
Musicians need to wear earplugs regularly	1	
Hearing protection not encouraged; stigma attached to wearing them	1	
High-tech ear plugs uncomfortable	1	
Regular orange ear plugs sufficient	1	
Rehearsals too loud	1	
Modify Loboda Stage to help diffuse volume		
Scheduling		18
Rotations important for Band members	13	
More recovery time after long jobs/injury	2	
Need more regular schedule	1	
Leadership needs to be aware of oversinging/do not overpractice (only point-fix problems)	2	
More personnel needed	8	8
Awareness/education of and prevention of job-related health issues	4	4
Uniform concerns		27
Cooler garments in warmer months	9	
Better/more comfortable shoes/orthotics	13	
Warmer garments should be worn in winter	3	
Long skirts hazardous	1	
Need back braces	1	
Need to reduce standing time	11	11
Need to reduce marching time	3	3
Concern about/have had job related injuries/pain	10	10
Personal changes (exercising, moderate work level, etc.)	6	6
Positive responses about Army/Band/Questionnaire	6	6

Problem	Each (n)	Total for Major Category (n)
Negative responses about Army/Band/Questionnaire	7	7
Other and Miscellaneous concerns about job	9	20
Injuries translate to lower moral when not taken seriously	3	
Can an alternative to running be offered?	1	
Don't make us use swivel instruments; brats is cheaper, better	1	
Equipment is substandard due to cost	1	
Long speeches should be eliminated	2	
Particular players (sousaphone, etc.) have particular challenges	1	
Should limit heavy lifting when not necessary	1	
Problems w/musical instruments are multi-faceted and cumulative	1	

(7) Questions for Specific Groups (Instrumentalists, Vocalists, Support, and Conductors).

(a) Table 53 shows the frequency and duration that instrumentalists reported playing their instruments, vocalists reported singing, and support personnel reported performing mission set-up. Most instrumentalists (95%, 167/176) reported playing (rehearsal, practice and performance) their primary instrument 5 to 7 days per week and 87% (153/176) reported playing 1 to 5 hours each day. As described in the Data Analysis section and in Appendix H, the frequencies and durations were used to calculate the approximate amount of weekly time spent playing and the mean±SD time was 931±382 min/wk. Many instrumentalists (47%, 83/176) reported playing another instrument or several instruments. Of those playing 1 or more additional instruments, most (59%, 49/83) played the instrument or instruments 1 to 3 days per week and 53% (44/83) reported playing 1 to 5 hours each time.

(b) Table 53 shows the frequency and duration that vocalists reported singing. Most vocalists (74%, 26/35) reported singing (rehearsal, practice, performance) 5 to 7 days per week and 83% (29/35) reported singing 1 to 5 hours each day. Twenty-six percent (9/35) of the vocalists reported that they also danced as part of their Band activities.

(c) For the support group there were only 16 individuals involved in set-up for Band performances (staging and audio/lighting personnel) with the others involved in a variety of other functions (library functions, supply, production, administration, operations, information management, and transportation.). Of the 16 involved in mission set-ups, 14 completed questionnaires. Of these, 57% (8/14) reported mission set-ups 4 to 5 days a week. Reported durations of mission set-ups were highly variable ranging from 1 to >7 hours.

(d) The two conductors (not reported in Table 53) reported rehearsing, practicing and/or performing 4 and 5 days/wk and both reported an average duration of 61-120 minutes.

Table 53. Frequency and Duration of Playing (Instrumentalists), Singing (Vocalists) or Mission Set-up (Support)

General Category of Question	Response Category	Instrumentalists				Vocalists		Support	
		Primary Instrument		Other Instruments		N	Proportion of Vocalists (n=35) (%)	N	Proportion of Support Group (n=14) (%)
		N	Proportion of All Instrumentalists (n=176) (%)	N	Proportion of Instrumentalists Playing Another Instrument or Other Instruments (n=83) (%)				
Frequency of Playing, Singing or Mission Set-Up	None	0	0	0	0	0	0	0	0
	<1 day/wk	0	0	13	15.7	0	0	0	0
	1 day/wk	0	0	17	20.5	0	0	1	7.1
	2 days/wk	1	0.6	19	22.9	0	0	0	0
	3 days/wk	1	0.6	13	15.7	1	2.9	4	28.6
	4 days/wk	7	4.0	7	8.4	8	22.9	7	50.0
	5 days/wk	38	21.6	7	8.4	15	42.9	1	7.1
	6 days/wk	70	39.8	2	2.4	7	20.0	0	0
	7 days/wk	59	33.5	5	6.0	4	11.4	0	0
	No response	0	0	0	0	0	0	1	7.1
Duration of Playing, Singing or Mission Set-Up	None	0	0	0	0	0	0	0	0
	<30 min	0	0	5	6.0	0	0	0	0
	30-60 min	3	1.7	32	38.6	4	11.4	0	0
	1-2 hours	28	15.9	23	27.7	17	48.6	5	35.7
	2-3 hours	41	23.3	13	15.7	7	20.0	1	7.1
	3-4 hours	54	30.7	6	7.2	4	11.4	1	7.1
	4-5 hours	30	17.0	2	2.4	1	2.9	1	7.1
	5-6 hours	12	6.8	1	1.2	1	2.9	3	21.4
	6-7 hours	5	2.8	0	0	0	0	0	0
	>7 hours	2	1.1	0	0	1	2.9	2	14.3
	No Response	1	0.6	1	1.2	0	1.2	1	7.1

(e) Table 54 shows the amount of years instrumentalists had been playing their primary musical instruments. Seventy four percent (130/176) had been playing for over 20 years.

Table 54. Years Playing Primary Musical Instrument

Response Category	N	Proportion (%)
<6 years	9	5.1
6-8 years	2	1.1
9-11 years	0	0.0
12-14 years	4	2.3
15-17 years	14	8.0
18-20 years	17	9.7
21-23 years	31	17.6
24-26 years	18	10.2
27-29 years	8	4.5
30-32 years	18	10.2
33-35 years	18	10.2
36-38 years	8	4.5
39-41 years	16	9.1
42-44 years	7	4.0
45-47 years	5	2.8
>47 years	1	0.6

(f) Table 55 shows the average amount of time spent standing reported by instrumentalists, vocalists and conductors during rehearsals, practices, or performances. Standing over 90 minutes was reported by 58% (102/176), 34% (12/35) and 100% (2/2) of the instrumentalists, vocalists, and conductors, respectively. Standing over 180 minutes was reported by 19% (34/176), 11% (4/35) and 0% (0/2) of the instrumentalists, vocalists, and conductors, respectively.

(g) The marching duration question was asked only of the instrumentalists. Table 55 shows the average amount of time spent marching reported by instrumentalists. Marching over 90 minutes/session was reported by 27% (47/176), although most instrumentalists (52%, 92/176) reported marching only up to 90 minutes.

Table 55. Time Spent Standing or Marching during Performances, Rehearsals and Practice by Group

	Standing						Marching	
Response Category	Instrumentalists		Vocalists		Conductors		Instrumentalists	
	N	Proportion of Instrumentalists (%)	N	Proportion of Vocalists (%)	N	Proportion of Conductors (%)	N	Proportion of Instrumentalists (%)
None	12	6.8	0	0	0	0	35	19.9
<30 min	21	11.9	3	8.6	0	0	44	25.0
30-60 min	25	14.2	12	34.3	0	0	26	14.8
61-90 min	15	8.5	8	22.9	0	0	22	12.5
91-120 min	26	14.8	5	14.3	1	50.0	19	10.8
121-150 min	21	11.9	1	2.9	1	50.0	5	2.8
151-180 min	21	11.9	2	5.7	0	0	12	6.8
181-240 min	28	15.9	3	8.6	0	0	10	5.7
>240 min	6	3.4	1	2.9	0	0	1	0.6
No Response	1	0.6	0	0	0	0	2	1.1

(h) Table 56 shows the reported amount of average time spent standing by unit. By far, the ceremonial group reported the most time standing. The proportion of Soldiers who reported standing an average of over 90 minutes was 56% (9/16), 91% (59/65), 67% (8/12), 18% (5/28), 34% (33/68), and 48% (10/21) in the blues, ceremonial, chorale, chorus, concert, and strings units, respectively.

Table 56. Time Spent Standing during Performances, Rehearsals and Practice by Unit

Response Category	Blues (n=16)		Ceremonial (n=65)		Chorale (n=12)		Chorus (n=28)		Concert (n=68)		Strings (n=21)	
	N	%	N	%	N	%	N	%	N	%	N	%
None	2	12.5	0	0	1	8.3	2	7.1	3	4.4	4	19.0
<30 min	1	6.3	0	0	1	8.3	3	10.7	17	25.0	2	9.5
30-60 min	3	18.8	3	4.6	1	8.3	11	39.3	16	23.5	3	14.3
61-90 min	1	6.3	3	4.6	1	8.3	7	25.0	9	13.2	2	9.5
91-120 min	2	12.5	10	15.4	4	33.3	1	3.6	8	11.8	6	28.6
121-150 min	3	18.8	10	15.4	0	0	1	3.6	6	8.8	2	9.5
151-180 min	0	0	12	18.5	2	16.7	0	0	17	10.3	2	9.5
181-240 min	4	25.0	23	35.4	1	8.3	2	7.1	1	1.5	0	0
>240 min	0	0	4	6.2	1	8.3	1	3.6	1	1.5	0	0

(i) Table 57 shows the reported amount of average time spent marching stratified by unit. This question was asked only of instrumentalists, so the vocalists in the chorus and chorale are not included in Table 57. The blues, ceremonial, chorale, and concert units reported marching time, while the strings did not. The proportion of Soldiers reporting marching an average of over 90 minutes was 61% (39/64) and 12% (8/67) in the ceremonial and concert groups, respectively. The other groups reported marching no more than 90 minutes on average.

Table 57. Time Spent Marching during Performances, Rehearsals and Practice by Unit

Response Category	Blues (n=16)		Ceremonial (n=64)		Chorale (n=3)		Chorus (n=2)		Concert (n=67)		Strings (n=21)	
	N	%	N	%	N	%	N	%	N	%	N	%
None	3	18.8	0	0	2	66.7	2	100	7	10.4	21	100
<30 min	9	56.3	2	3.1	1	33.3	0	0	23	47.8	0	0
30-60 min	1	6.3	14	21.5	0	0	0	0	11	16.4	0	0
61-90 min	3	18.8	10	15.4	0	0	0	0	9	13.4	0	0
91-120 min	0	0	14	21.5	0	0	0	0	5	7.5	0	0
121-150 min	0	0	4	6.2	0	0	0	0	1	1.5	0	0
151-180 min	0	0	10	15.4	0	0	0	0	2	3.0	0	0
181-240 min	0	0	10	15.4	0	0	0	0	0	0	0	0
>240 min	0	0	1	1.5	0	0	0	0	0	0	0	0

(j) Table 58 shows the average proportion (%) of time spent standing for the instrumentalists, vocalists and conductors during rehearsals, practices, or performances. Standing over 50% of the time was reported by 50% (88/176) of instrumentalists, 60% (21/35) of vocalists and 100% (2/2) of conductors.

(k) The marching question was only asked of the instrumentalists. Table 58 shows the average proportion (%) of time spent marching by instrumentalists. Twenty-three percent (41/176) of instrumentalists reported spending over half their time marching.

Table 58. Proportion of Time Standing or Marching During Performances, Rehearsals and Practice by Group

Response Category	Standing						Marching	
	Instrumentalists		Vocalists		Conductors		Instrumentalists	
	N	Proportion of Instrumentalists (%)	N	Proportion of Vocalists (%)	N	Proportion of Conductors (%)	N	Proportion of Instrumentalists (%)
None	13	7.4	0	0	0	0	34	19.3
1-10%	2	1.1	1	2.9	0	0	1	0.6
11-20%	30	17.0	1	2.9	0	0	66	37.5
21-30%	20	11.4	1	2.9	0	0	10	5.7
31-40%	10	5.7	2	5.7	0	0	7	4.0
41-50%	12	6.8	9	25.7	0	0	15	8.5
51-60%	14	8.0	6	17.1	0	0	8	4.5
61-70%	12	6.8	1	2.9	1	50.0	6	3.4
71-80%	15	8.5	4	11.4	0	0	12	6.8
81-90%	15	8.5	3	8.6	0	0	9	5.1
91-100%	32	18.2	7	20.0	1	50.0	6	3.4
No Response	1	0.6	0	0	0	0	2	1.1

(l) Table 59 shows the reported proportion (%) of time spent standing during rehearsals, practices, or performances stratified by unit. Again, the ceremonial unit reported the largest proportion of time spent standing by far. The proportions of Soldiers that reported spending more than half their time standing , on average, were 50% (8/16) of the blues unit, 92% (60/65) of the ceremonial unit, 75% (9/12) of the chorale unit, 46% (13/28) of the chorus unit, 22% (15/68) of the concert unit, and 19% (4/21) of the strings unit.

Table 59. Proportion of Time Standing during Performances, Rehearsals and Practice by Unit

Response Category	Blues (n=16)		Ceremonial (n=64)		Chorale (n=12)		Chorus (n=28)		Concert (n=67)		Strings (n=21)	
	N	%	N	%	N	%	N	%	N	%	N	%
None	2	12.5	1	1.5	2	16.7	2	7.1	2	2.9	4	19.0
1-10%	0	0	0	0	0	0	1	3.6	2	2.9	0	0
11-20%	3	18.8	0	0	0	0	1	3.6	25	36.8	2	9.5
21-30%	2	12.5	0	0	1	8.3	0	0	14	20.6	4	19.0
31-40%	0	0	1	1.5	0	0	2	7.1	6	8.8	3	14.3
41-50%	1	6.3	3	4.6	0	0	9	32.1	4	5.9	4	19.0
51-60%	3	18.8	5	7.7	1	8.3	5	17.9	5	7.4	1	4.8
61-70%	1	6.3	8	12.3	0	0	1	3.6	1	1.5	2	9.5
71-80%	3	18.8	8	12.3	1	8.3	3	10.7	4	5.9	0	0
81-90%	1	6.3	11	16.9	2	16.7	2	7.1	1	1.5	1	4.8
91-100%	0	0	28	43.1	5	41.7	2	7.1	4	5.9	0	0

(m) Table 60 shows the reported proportion (%) of time spent marching by unit during rehearsals, practices, or performances. This question was asked only of instrumentalists so the vocalists in the chorus and chorale are not included in Table 60 (although the instrumentalists in the chorus and chorale units are included). The ceremonial group reported the largest proportion of time spent marching. The proportions of Soldiers that reported spending more than 50% of their time marching were 6% (1/16) of the blues unit, 56% (36/64) of the ceremonial unit, and 6% (4/67) of the concert unit. The chorale, chorus, and strings unit instrumentalists reported little marching.

Table 60. Proportion of Time Marching During Performances, Rehearsals and Practice by Unit

Response Category	Blues (n=16)		Ceremonial (n=64)		Chorale (n=3)		Chorus (n=2)		Concert (n=67)		Strings (n=21)	
	N	%	N	%	N	%	N	%	N	%	N	%
None	3	18.8	0	0	2	66.7	2	100	6	8.8	21	100
1-10%	1	6.3	0	0	0	0	0	0	0	0	0	0
11-20%	11	68.8	8	12.5	1	33.3	0	0	46	67.6	0	0
21-30%	0	0	3	4.7	0	0	0	0	7	10.3	0	0
31-40%	0	0	5	7.8	0	0	0	0	2	2.9	0	0
41-50%	0	0	12	18.8	0	0	0	0	3	4.4	0	0
51-60%	0	0	7	10.9	0	0	0	0	1	1.5	0	0
61-70%	1	6.3	5	7.8	0	0	0	0	0	0	0	0
71-80%	0	0	9	14.1	0	0	0	0	3	4.4	0	0
81-90%	0	0	9	14.1	0	0	0	0	0	0	0	0
91-100%	0	0	6	9.4	0	0	0	0	0	0	0	0

(n) Table 61 shows the instrumentalists, vocalists and conductors who reported receiving wellness instruction in music school or in the Army. Vocalists were more likely to report having received instruction compared to instrumentalists or conductors. Instrumentalists and vocalists were more likely to report having received wellness instruction in the Army compared to music school. Conductors did not report receiving any wellness instruction.

Table 61. Wellness Instruction

Response Category	Wellness Taught in Music School						Wellness Taught in Army					
	Instrumentalists		Vocalists		Conductors		Instrumentalists		Vocalists		Conductors	
	N	Proportion (%)	N	Proportion (%)	N	Proportion (%)	N	Proportion (%)	N	Proportion (%)	N	Proportion (%)
Yes	36	20.5	14	40.0	0	0	86	48.9	22	62.9	0	0
No	138	78.4	20	57.1	2	100.0	87	49.4	13	37.0	2	100.0
No Response	2	1.1	1	2.9	0	0	3	1.7	0	0	0	0

(o) Table 62 shows the proportion of Soldiers that reported feeling relaxed while playing and those that deliberately relaxed their muscles when playing. About 2/3 of the instrumentalists and both conductors felt relaxed while playing and about the same proportions deliberately relaxed their muscles. Of those who felt relaxed while playing, 73% (88/120) also deliberately relaxed their muscles.

Table 62. Relaxation While Performing

Response Category	Feel Relaxed While Playing				Deliberately Relax Muscles While Playing			
	Instrumentalists		Conductors		Instrumentalists		Conductors	
	N	Proportion (%)	N	Proportion (%)	N	Proportion (%)	N	Proportion (%)
Yes	120	68.2	2	100.0	122	69.3	0	0
No	54	30.7	0	0	53	30.1	2	100.0
No Response	2	1.1	0	0	0	0	0	0

f. Injury and Musculoskeletal Symptoms Risk Factors. For the risk factor analysis, three outcome measures were examined: documented injuries in 2005 (from the CII), self-reported duty-related injuries in 2005 (from questionnaire), and musculoskeletal symptoms prevalence (from questionnaire). Table 63 recapitulates descriptive data by gender on these outcome measures. For documented injuries in 2005 and self-reported duty-related injuries in 2005, only Soldiers present in the Band for the entire year were included. For current musculoskeletal symptoms prevalence, all Soldiers who responded to the questionnaire were included. It is of interest that the documented injury incidence in 2005 did not differ between men and women but for self-reported duty-related injury and musculoskeletal symptoms prevalence, women reported more injuries and symptoms and thus had a higher incidence than men.

Table 63. Injury and Musculoskeletal Symptoms Prevalence Data

		Men	Women	Men and Women
Documented Injured in 2005 (DMSS data)	Total N	202	53	255
	Proportion Injured (%)	51.5	50.9	51.4
	p-value	0.94		
Self-Reported Duty-Related Injuries in 2005 (questionnaire data)	Total N	177	48	225
	Proportion Injured (%)	35.0	56.3	39.6
	p-value	<0.01		
Self-Reported Musculoskeletal Symptoms (questionnaire data)	Total N	176	48	224
	Proportion Positive (%)	60.8	75.0	63.8
	p-value	0.07		

(1) Risk Factors for Documented Injuries (Univariate).

(a) Table 64 shows the results of the univariate chi square analysis examining associations between documented injuries in 2005 (CII) and various potential risk factors. Unit, functional group, and a prior injury in 2004 were associated with higher injury incidence. Gender, age, educational status, marital status, race, time in service and time in the Band were not associated with injury incidence.

Table 64. Association Between Documented Injuries in 2005 and Potential Risk Factors

Variable	Level of Variable	N	Proportion Injured (%)	Chi-Square p-value	Linear Trend p-value[a]
Gender	Men	202	51.5	0.94	----
	Women	53	50.9		
Unit	Strings	20	80.0		
	Blues	18	66.7		
	Chorus	28	60.9		
	Chorale	15	53.3	0.02	----
	Ceremonial	68	48.5		
	Concert	68	39.7		
	Officers	4	25.0		
	Support (Administration)	18	33.3		
	Support (Staging/Lighting)	16	68.8		
Functional Group	Strings	35	68.6		
	Keyboard	6	66.7		
	Vocal	27	63.0		
	Percussion	16	62.5	<0.01	----
	Brass	94	51.1		
	Woodwinds	39	25.6		
	Conductors	4	25.0		
	Support (Administration)	18	33.3		
	Support (Staging/Lighting)	16	68.8		
Age	22.0-30.0 years	27	40.7		
	30.1-35.0 years	53	54.7		
	35.1-40.0 years	48	47.9		
	40.1-45.0 years	50	56.0	0.64	0.61
	45.1-50.0 years	43	58.1		
	>50.0 years	29	44.8		
Educational Status[b]	High School /Some College	52	61.5		
	Bachelor's Degree	84	46.4	0.23	----
	Master's Degree or Higher	105	52.4		
Marital Status[b]	Single	46	50.0		
	Married	177	53.1	0.93	----
	Other	23	52.2		
Race[b]	White	217	51.2		
	Black	22	50.0	0.99	----
	Other	10	50.0		
Time In Service[b]	1.3-6.7 years	62	53.2		
	6.8-13.7 years	63	46.0	0.78	0.96
	13.8-19.6 years	62	54.8		
	19.7-34.1 years	63	50.8		
Time in Band[b]	1.1-5.1 years	62	50.0		
	5.2-9.7 years	58	51.7	0.96	0.85
	9.8-16.6 years	64	54.7		
	16.7-33.9 years	63	50.8		
Injury in 2004	No	139	39.6	<0.01	----
	Yes	116	65.6		

[a]Where applicable

[b]Does not include unknowns. In all cases, unknowns had little effect on p-values

(b) Table 65 shows the results of the univariate analysis examining associations between documented injuries in 2005 and potential risk factors related to physical characteristics and physical fitness. In this analysis, men and women were separated because of the large gender differences in the independent variables (height, weight, fitness).

(c) Table 65 shows that for the men, higher weight, higher BMI and slower 2-mile run times were associated with higher injury risk. Table 66 presents the results when only the first and last quartiles of each variable were considered. Despite the reduction in statistical power because of the smaller sample sizes, heavier and less physically fit men are at higher injury risk in this analysis.

Table 65 shows that the group sizes for the female tertiles were small, limiting statistical power and resulting in instability in the data (i.e., a small difference in injury rates could easily influence the data in a particular tertile). There were trends suggesting that shorter stature and less body weight were associated with higher injury rates. Table 66 shows comparisons of tertiles for the women and emphasizes the inconsistency and low statistical power of the comparisons.

Table 65. Association Between Documented Injuries in 2005 and Potential Risk Factors Relating to Physical Characteristics and Physical Fitness

	Men					Women				
Variable	Level of Variable	N	Proportion Injured (%)	Chi-Square p-value	Linear Trend p-value	Level of Variable	N	Proportion Injured (%)	Chi-Square p-value	Linear Trend p-value
Height	64-68 inches	41	58.5			59-63 inches	13	76.9		
	69-71 inches	86	55.8	0.20	0.14	64-66 inches	24	50.0	0.12	0.05
	72-73 inches	49	38.8			67-69 inches	11	36.4		
	74-76 inches	26	50.0							
Weight	111-168 pounds	49	36.7			98-127 pounds	16	75.0		
	169-185 pounds	53	58.5	0.10	0.08	128-139 pounds	16	43.8	0.12	0.08
	186-204 pounds	50	52.0			140-190 pounds	16	43.8		
	205-264 pounds	50	58.0							
BMI	18.5-24.5 kg/m^2	45	40.0			17.1-21.1 kg/m^2	15	53.3		
	24.6-26.1 kg/m^2	50	46.0	0.06	<0.01	21.2-23.8 kg/m^2	16	50.0	0.82	0.68
	26.2-28.2 kg/m^2	48	60.4			23.9-28.9 kg/m^2	13	61.5		
	28.3-36.8 kg/m^2	50	64.0							

	Men					Women				
Variable	Level of Variable	N	Proportion Injured (%)	Chi-Square p-value	Linear Trend p-value	Level of Variable	N	Proportion Injured (%)	Chi-Square p-value	Linear Trend p-value
Push-ups	20-39 repetitions	44	63.6	0.21	0.50	13-19 repetitions	19	42.1	0.53	0.28
	40-42 repetitions	47	42.6			20-27 repetitions	9	55.6		
	43-55 repetitions	49	46.9			28-50 repetitions	13	61.5		
	56-132 repetitions	52	53.2							
Sit-ups	29-42 repetitions	47	55.3	0.45	0.17	33-46 repetitions	14	50.0	0.55	0.48
	43-50 repetitions	51	58.8			47-67 repetitions	14	42.9		
	51-65 repetitions	42	47.6			68-90 repetitions	16	62.5		
	66-111 repetitions	52	45.2							
2-Mile Run	12.0-15.2 minutes	38	34.2	0.19	0.05	14.7-17.8 minutes	12	41.7	0.77	0.54
	15.3-16.0 minutes	38	39.5			17.9-19.2 minutes	9	55.6		
	16.1-17.1 minutes	40	55.0			19.3-22.8 minutes	11	54.5		
	17.2-18.8 minutes	36	52.8							
Total APFT Score	182-207 points	39	41.0	0.23	0.47	187-228 points	10	50.0	0.09	0.38
	208-225 points	34	58.8			229-253 points	10	20.0		
	226-253 points	38	36.8			254-300 points	12	66.7		
	254-300 points	36	38.9							

Table 66. Comparisons of Physical Characteristics and Physical Fitness Quartiles 1 and 4 for Men and Tertiles 1 and 3 for Women

Variable	Men			Women		
	Comparison	RR (95%CI)	p-value	Comparison	RR(95%CI)	p-value
Height	64-68 / 74-76 inches	1.28 (0.85-1.93)	0.23	59-63 / 67-69 inches	2.14 (0.90-5.09)	0.05
Weight	205-264 / 111-168 pounds	1.58 (1.02-2.44)	0.03	140-190 / 98-127 pounds	0.63 (0.35-1.15)	0.12
BMI	28.3-36.8 / 18.5-24.5 kg/m^2	1.53 (1.04-2.27)	0.03	23.9-28.9 / 17.1-21.1 kg/m^2	1.13 (0.60-2.11)	0.71
Push-ups	20-39 / 56-132 repetitions	1.43 (0.96-2.13)	0.07	13-19 / 28-50 repetitions	0.89 (0.44-1.81)	0.74
Sit-ups	29-42 / 66-111 repetitions	1.46 (0.93-2.31)	0.09	33-46 / 68-90 repetitions	1.34 (0.69-2.59)	0.38
Two-Mile Run	17.2-18.8 / 12.0-15.2 minutes	1.46 (0.95-2.23)	0.07	19.3-22.8 / 14.7-17.8 minutes	1.29 (0.22-7.56)	0.74
Total APFT Score	182-207 / 254-300 points	1.05 (0.06-1.84)	0.85	187-228 / 254-300 points	0.71 (0.33-1.57)	0.39

(e) Table 67 shows the association between documented injuries in 2005 and potential risk factors from the questionnaire (including quartiles of the calculated total physical activity). The smoking and smokeless tobacco questions were not included because very few Soldiers used these substances. On some questions categories were collapsed in order to increase statistical power. Other activity frequency and self-rated physical activity were associated with higher injury risk. Those who rated themselves "much less active" to "somewhat less active" also tended to have higher injury rates.

Table 67. Association Between Documented Injuries in 2005 and Potential Risk Factors from Questionnaire

Variable	Level of Variable	N	Proportion Injured (%)	Chi-Square p-value	Linear Trend p-value[a]
Shoe Problems	No	104	50.0	0.46	----
	Yes	120	55.0		
Uniform Problems	No	102	51.0	0.68	----
	Yes	119	53.8		
Aerobic Activity Frequency	0-1 day/wk	22	59.1	0.34	0.64
	2-3 days/wk	137	47.4		
	4-7 days/wk	78	56.4		
Aerobic Activity Duration (session)	0-14 min/day	8	62.5	0.44	0.37
	15-30 min/day	49	44.9		
	31-60 min/day	153	51.0		
	>60 min/day	27	63.1		
Aerobic Activity Duration (week)	0-88 min/wk	59	49.2	0.76	0.39
	89-152 min/wk	70	50.0		
	153-228 min/wk	47	48.9		
	229-536 min/wk	61	57.4		
Strength Training Frequency	0-1 day/wk	68	55.9	0.23	0.12
	2-3 days/wk	122	53.3		
	4-7 days/wk	47	40.4		
Strength Training Duration (session)	0-14 min/day	43	48.8	0.38	0.87
	15-30 min/day	77	49.4		
	31-60 min/day	96	57.3		
	>60 min/day	21	38.1		
Strength Training Duration (week)	0-38 min/wk	59	49.2	0.37	0.65
	39-88 min/wk	67	55.2		
	89-176 min/wk	54	42.6		
	177-536 min/wk	57	57.9		
Sports Frequency	0-1 day/wk	176	51.1	0.94	0.96
	2-3 days/wk	37	54.1		
	4-7 days/wk	24	50.0		
Sports Duration (session)	0-14 min/day	103	50.5	0.33	0.78
	15-30 min/day	15	66.7		
	31-60 min/day	58	44.8		
	>60 min/day	28	60.7		
Sports Duration (week)	0-7 min/wk	107	49.5	0.36	0.79
	22-76 min/wk	51	58.8		
	77-536 min/wk	49	44.9		
Other Activity Frequency	0-1 day/wk	68	57.4	0.10	0.10
	2-3 days/wk	105	51.4		
	4-7 days/wk	61	42.6		
Other Activity Duration (session)	0-30 min/day	27	51.9	0.48	0.37
	31-60 min/day	83	48.2		
	61-120 min/day	62	53.2		
	121-180 min/day	32	43.8		
	181->300 min/day	29	65.5		

Variable	Level of Variable	N	Proportion Injured (%)	Chi-Square p-Value	Linear Trend p-Value[a]
Other Activity Duration (week)	0-104 min/wk	51	56.9	0.66	0.86
	105-208 min/wk	64	45.3		
	209-450 min/wk	58	51.7		
	451-2640 min/wk	59	52.5		
Self-Rated Physical Activity	Much to Somewhat More Active	154	51.9	0.07	0.52
	About the Same	59	42.4		
	Much to Somewhat Less Active	21	71.4		
Satisfaction with Medical Care	Completely to Reasonably Satisfied	155	47.7	0.36	0.20
	Borderline	50	58.0		
	Moderately to Extremely Unsatisfied	28	57.1		

[a]Where Applicable

(f) Some questionnaire items involved only specific groups within the Band. Table 68 shows the association between responses to these questions and documented injuries in 2005. At higher injury risk were instrumentalists who spent longer hours per week playing their primary instrument, vocalists who spent less time singing or dancing, and support members who spent more time in Band set-up/tear-down.

Table 68. Association Between Documented Injuries in 2005 and Potential Risk Factors from Questionnaire Items That Involved Selected Groups

Group	Variable	Level of Variable	N	Proportion Injured (%)	Chi-Square p-Value	Linear Trend p-Value[a]
Instrumental-ists	Years Playing Primary Musical Instrument	<6-20 years	43	53.5	0.95	0.59
		21-26 years	49	53.1		
		27-35 years	43	48.8		
		>35 years	37	48.6		
	Frequency of Playing Primary Instrument in Last Year	2-5 days/wk	45	40.0	0.21	0.21
		6 days/wk	69	56.5		
		7 days/wk	58	53.4		
	Duration of Playing Primary Musical Instrument in Last Year (session)	30-120 min	31	54.8	0.24	0.25
		121-180 min	38	35.8		
		181-240 min	53	49.1		
		241-300 min	30	63.3		
		>300 min	19	57.9		

Group	Variable	Level of Variable	N	Proportion Injured (%)	Chi-Square p-Value	Linear Trend p-Value[a]
	Duration of Playing Primary Musical Instrument in the Last Year (week)	225-900 min/wk 901-1350 min/wk 1351-1680 min/wk 1681-3600 min/wk	42 42 42 45	52.4 35.7 52.4 62.2	0.10	0.17
	Play Another Musical Instrument	No Yes	91 81	50.5 51.9	0.97	----
	Frequency of Playing Other Musical Instrument	<1-2 days/wk 3-4 days/wk >4 days/wk	48 12 21	54.2 50.0 47.6	0.87	0.61
	Duration of Playing Other Musical Instrument	<30-60 min 61-120 min >120 min	36 23 22	58.3 52.2 40.9	0.44	0.21
	Duration of Marching	0-<30 min 30-60 min 61-120 min >120 min	78 25 39 28	55.1 44.0 51.3 42.9	0.63	0.32
Vocalists	Also Dance for Band	No Yes	25 8	60.0 62.5	0.90	----
	Frequency of Singing/Dancing	3-5 days/wk 6-7 days/wk	22 11	68.2 45.5	0.21	----
	Duration of Singing/Dancing	30-120 min 121-420 min	19 14	73.7 42.9	0.07	----
Instrumentalists Vocalists Conductors	Duration of Standing	0-60 min 61-120 min 121-180 min >180 min	70 53 45 38	48.6 56.6 53.3 52.6	0.85	0.68
	Wellness Instruction in Music School	No Yes	156 48	51.9 54.2	0.79	----
	Wellness Instruction in Army	No Yes	98 106	57.1 49.1	0.25	----

Group	Variable	Level of Variable	N	Proportion Injured (%)	Chi-Square p-Value	Linear Trend p-Value[a]
Instrumentalists Vocalists	Feel Relaxed While Playing/Conducting	No Yes	53 119	52.8 50.4	0.77	----
	Deliberately Relax While Playing/Conducting	No Yes	51 123	54.9 49.6	0.52	----
Support	Frequency of Mission Set-up/Tear Down	0 days/wk 3-5 days/wk	17 13	29.4 61.5	0.08	----
	Duration of Mission Set-Up and Tear Down	0 min 60-660 min	17 10	33.3 60.0	0.17	----

[a]Where Applicable

(2) Risk Factors for Documented Injuries (Multivariate).

(a) Multivariate logistic regression was performed for the combined male and female data using the variables in Tables 64 and 67. Unit, functional group, educational status, injury in 2004, strength training frequency, other activity frequency, and self-rated physical activity met the $p<0.25$ criteria for entry into the multivariate model. Because of the small sample size, conductors (officers) were not included in the analysis (only 2 completed the questionnaire). There were 231 Soldiers with complete data and 66% of them were correctly classified by the backward stepping model. Functional group, injury in 2004, and frequency of other physical activity remained in the final model as shown in Table 69.

Table 69. Multivariate Logistic Regression Results from Backward Stepping Model with Documented Injury in 2005 as the Dependent Variable

Variable	Level of Variable	N	Odds Ratio (95%CI)	p-value
Functional Group	Woodwinds	38	1.00	-----
	Strings	31	12.66 (3.92-40.89)	<0.01
	Keyboard	5	9.71 (0.89-105.62)	0.06
	Percussion	16	6.13 (1.63-22.98)	<0.01
	Vocal	26	5.73 (1.84-17.88)	<0.01
	Support (Staging/Audio)	13	5.12 (1.26-20.69)	0.02
	Brass	85	3.25 (1.31-8.03)	0.01
	Support (Admin)	17	1.23 (0.32-4.76)	0.76
Injury in 2004	No	129	1.00	-----
	Yes	102	2.91 (1.62--5.23)	<0.01
Frequency of Other Physical Activity	0-1day/wk	66	2.24 (1.01-4.96)	0.05
	2-3 days/wk	105	1.94 (0.95-3.98)	0.07
	4-7 days/wk	60	1.00	-----

(b) Data for instrumentalists only were considered in a separate logistic regression model. Other groups (vocalists, support, conductors) were not considered because of the small group sizes. Variables that met the $p<0.25$ criterion for entry into the model included unit, functional group, educational status, injury in 2004, strength training frequency, other activity frequency, and self-rated physical activity, frequency of playing primary instrument, duration of playing primary instrument, proportion of time spent marching, and proportion of time spent standing. Table 70 shows the final results. There were only 79 Soldiers with complete data on all variables. Seventy-one percent of the instrumentalists were correctly classified by the 3 variables in Table 70.

Table 70. Multivariate Logistic Regression Results from Backward Stepping Model of Instrumentalists with Documented Injuries in 2005 as the Dependent Variable

Variable	Level of Variable	N	Odds Ratio (95%CI)	p-value
Strength Training Frequency	0-1 days/wk	21	9.48 (1.48-60.77)	0.02
	2-3 days/wk	43	4.60 (0.87-24.44)	0.07
	4-7 days/wk	15	1.00	----
Frequency of Playing Primary Instrument	2-5 days/wk	20	1.00	----
	6 days/wk	35	4.37 (1.11-17.21)	0.04
	7 days/wk	24	21.49 (3.57-129.25)	<0.01
Injured in 2004	No	40	1.00	----
	Yes	39	4.00 (1.32-12.05)	0.01

(c) In order to include the APFT data, a separate multivariate analysis was run for the men only. This analysis included unit, functional group, educational status, injury in 2004, strength training frequency, other activity frequency, self-rated physical activity, BMI quartiles, push-up quartiles, sit-up quartiles, and 2-mile run quartiles. The backward stepping procedure resulted in a model with 131 men with complete data and 66% of the men were correctly classified (i.e., injured classified as injured and uninjured classified as uninjured by the logistic regression model). Table 71 shows that independent risk factors for documented injuries included frequency of other physical activity, self-rated of physical activity, a prior injury in 2004, and slower 2-mile run time.

Table 71. Multivariate Logistic Regression Results from Backward Stepping Model of Men Including APFT Data with Documented Injuries in 2005 as the Dependent Variable

Variable	Level of Variable	N	Odds Ratio (95%CI)	p-value
Frequency of Other Physical Activity	0-1 day/wk	39	1.73(0.62-4.83)	0.29
	2-3 days/wk	55	2.95 (1.31-7.67)	0.03
	4-7 days/wk	37	1.00	----
Self-Rating of Physical Activity	Much to Somewhat More Active	86	1.00	---
	About the Same	33	0.43 (0.17-1.09)	0.07
	Much to Somewhat Less Active	12	3.15(0.58-16.47)	0.18
Injured in 2004	No	83	1.00	----
	Yes	48	2.07 (0.92-4.65)	0.08
2-Mile Run Times	12.0-15.2 minutes	33	1.00	----
	15.3-16.0 minutes	30	2.38(0.78-7.21)	0.12
	16.1-17.1 minutes	37	3.58 (1.20-10.73)	0.02
	17.2-18.8 minutes	31	2.26 (0.73-6.99)	0.16

(3) Risk Factors for Self-Reported Duty-Related Injuries (Univariate).

(a) This analysis included Band members who were present in the Band during all of 2005. Table 72 shows the results of the univariate chi square analysis examining associations between self-reported duty-related injuries in 2005 and various potential risk factors. Gender and race were associated with higher injury incidence. It is of interest that documented injuries in 2005 and injuries in 2004 were not associated with self-reported duty-related injuries.

Table 72. Association Between Self-Reported Duty-Related Injuries in 2005 and Potential Risk Factors

Variable	Level of Variable	N	Proportion Injured (%)	Chi-Square p-Value	Linear Trend p-Value[a]
Gender	Men	177	35.0	<0.01	----
	Women	48	56.3		
Unit	Strings	20	40.0		
	Blues	17	29.4		
	Chorus	27	22.2		
	Chorale	11	54.5	0.17	----
	Ceremonial	62	48.4		
	Concert	67	35.8		
	Officers	2	0		
	Support (Administrative)	6	33.3		
	Support (Staging/Audio)	13	61.5		
Functional Group	Strings	32	40.6		
	Keyboard	5	0		
	Vocal	26	34.6	0.39	----
	Percussion	16	31.3		
	Brass	87	40.2		
	Woodwinds	38	44.7		
	Conductors	2	0		
	Support (Administrative)	6	33.3		
	Support (Staging/Audio)	13	61.5		
Age	22.0-30.0 years	24	33.3		
	30.1-35.0 years	47	44.7		
	35.1-40.0 years	44	45.5	0.80	0.79
	40.1-45.0 years	42	40.5		
	45.1-50.0 years	37	32.4		
	>50.0 years	26	42.3		
Educational Status[b]	High School /Some College	41	48.8		
	Bachelor's Degree	76	36.8	0.42	----
	Master's Degree or Higher	96	38.5		

Variable	Level of Variable	N	Proportion Injured (%)	Chi-Square p-Value	Linear Trend p-Value[a]
Marital Status[b]	Single	38	39.5		
	Married	160	39.4	0.80	----
	Other	19	47.4		
Race[b]	White	194	38.1		
	Black	18	50.0	0.08	----
	Other	8	75.0		
Time In Service[b]	1.3-6.7 years	56	39.3		
	6.8-13.7 years	58	41.4	0.51	0.47
	13.8-19.6 years	54	44.4		
	19.7-34.1 years	52	30.8		
Time in Band[b]	1.1-5.1 years	55	40.0		
	5.2-9.7 years	52	44.2	0.90	0.65
	9.8-16.6 years	56	39.3		
	16.7-33.9 years	54	37.0		
Injury in 2004	No	127	38.6	0.73	----
	Yes	98	40.8		
Injury in 2005	No	106	35.8	0.28	----
	Yes	119	42.9		

[a]Where Applicable
[b]Does not include unknowns. In all cases, unknowns had little effect on p-values

(b) Table 73 shows the results of the univariate analysis examining associations between self-reported duty-related injuries in 2005 and potential risk factors relating to physical characteristics and physical fitness. In this analysis, men and women were separated because of the large gender differences in the independent variables (height, weight, fitness). Table 73 shows that for the men, those who performed fewer push-ups, fewer sit-ups, or had a slower 2-mile run time were at higher injury risk. For the women, greater injury risk was associated with shorter stature and fewer sit-ups.

Table 73. Association Between Self-Reported Duty-Related Injuries in 2005 and Potential Risk Factors Relating to Physical Characteristics and Physical Fitness

	Men					Women				
Variable	Level of Variable	N	Proportion Injured (%)	Chi-Square p-value	Linear Trend p-value	Level of Variable	N	Proportion Injured (%)	Chi-Square p-value	Linear Trend p-value
Height	64-68 inches	38	28.9			59-63 inches	13	76.9		
	69-70 inches	75	40.0	0.32	0.72	64-66 inches	24	50.0	0.21	0.11
	71-72 inches	41	39.0			67-69 inches	11	45.5		
	73-76 inches	23	21.7							
Weight	111-168 pounds	44	31.8			98-127 pounds	16	62.5		
	169-185 pounds	47	48.9	0.13	0.34	128-139 pounds	16	56.3	0.78	0.48
	186-204 pounds	43	30.2			140-190 pounds	16	50.0		
	205-264 pounds	43	27.9							
BMI	18.5-24.5 kg/m^2	39	41.0			17.1-21.1 kg/m^2	15	46.7		
	24.6-26.1 kg/m^2	46	41.3	0.45	0.13	21.2-23.8 kg/m^2	16	62.5	0.59	0.99
	26.2-28.2 kg/m^2	40	32.5			23.9-28.9 kg/m^2	13	46.2		
	28.3-36.8 kg/m^2	44	27.3							
Push-ups	20-39 repetitions	38	48.2			13-19 repetitions	19	57.9		
	40-42 repetitions	41	36.6	0.04	0.12	20-27 repetitions	9	44.4	0.81	0.78
	43-55 repetitions	42	21.4			28-50 repetitions	13	53.8		
	56-132 repetitions	56	28.9							
Sit-ups	29-42 repetitions	39	47.4			33-46 repetitions	14	71.4		
	43-50 repetitions	43	34.9	0.08	0.09	47-67 repetitions	14	64.3	0.06	0.03
	51-65 repetitions	38	23.7			68-90 repetitions	16	31.3		
	66-111 repetitions	57	28.2							

	Men					Women				
Variable	Level of Variable	N	Proportion Injured (%)	Chi-Square p-value	Linear Trend p-value	Level of Variable	N	Proportion Injured (%)	Chi-Square p-value	Linear Trend p-value
2-Mile Run	12.0-15.2 minutes	39	17.1	0.03	0.03	14.7-17.8 minutes	12	66.7	0.59	0.55
	15.3-16.0 minutes	37	45.9			17.9-19.2 minutes	9	44.4		
	16.1-17.1 minutes	40	36.4			19.3-22.8 minutes	11	54.5		
	17.2-18.8 minutes	35	47.1							
Total APFT Score	182-207 points	39	50.0	0.19	0.32	187-228 points	10	50.0	0.09	0.38
	208-225 points	39	30.0			229-253 points	10	80.0		
	226-253 points	33	26.5			254-300 points	12	33.3		
	254-300 points	36	36.1							

(c) Table 74 shows the association between self-reported duty-related injuries and potential risk factors from the questionnaire. Higher injury risk was associated with reported shoe problems, reported uniform problems, high or low weekly aerobic activity (bimodal relationship), high or low weekly strength training (bimodal relationship), less self-rated physical activity, and less satisfaction with medical care.

Table 74. Association between Self-Reported Duty-Related Injuries and Potential Risk Factors from Questionnaire

Variable	Level of Variable	N	Proportion Injured (%)	Chi-Square p-value	Linear Trend p-value[a]
Shoe Problems	No	100	32.0	0.03	___
	Yes	119	46.2		
Uniform Problems	No	100	32.0	0.03	___
	Yes	118	46.6		
Aerobic Activity Frequency	0-1 day/wk	20	50.0	0.60	0.48
	2-3 days/wk	129	38.8		
	4-7 days/wk	76	38.2		
Aerobic Activity Duration (session)	0-14 min/day	8	37.5	0.59	0.30
	15-30 min/day	47	36.2		
	31-60 min/day	145	38.6		
	>60 min/day	25	52.0		
Aerobic Activity Duration (week)	0-88 min/wk	56	42.9	0.10	0.59
	89-152 min/wk	66	36.4		
	153-228 min/wk	45	26.7		
	229-536 min/wk	58	50.0		

Variable	Level of Variable	N	Proportion Injured (%)	Chi-Square p-Value	Linear Trend p-Value[a]
Strength Training Frequency	0-1 day/wk	64	43.8	0.72	0.49
	2-3 days/wk	116	37.9		
	4-7 days/wk	45	37.9		
Strength Training Duration (session)	0-14 min/day	41	39.0	0.57	0.36
	15-30 min/day	72	33.3		
	31-60 min/day	92	43.5		
	>60 min/day	20	45.0		
Strength Training Duration (week)	0-38 min/wk	56	41.1	0.06	0.16
	39-88 min/wk	64	31.3		
	89-176 min/wk	49	32.7		
	177-536 min/wk	56	53.6		
Sports Frequency	0-1 day/wk	168	39.9	0.98	0.83
	2-3 days/wk	33	39.4		
	4-7 days/wk	24	37.5		
Sports Duration (session)	0-14 min/day	99	38.4	0.76	0.40
	15-30 min/day	15	33.3		
	31-60 min/day	53	45.3		
	>60 min/day	27	44.4		
Sport Activity (week)	0 min/wk	99	38.4	0.65	0.91
	7-67 min/wk	48	45.8		
	68-536 min/wk	50	38.0		
Other Activity Frequency	0-1 day/wk	62	35.5	0.62	0.63
	2-3 days/wk	102	43.1		
	4-7 days/wk	58	39.7		
Other Activity Duration (session)	0-30 min/day	25	36.0	0.91	0.69
	31-60 min/day	80	42.5		
	61-120 min/day	58	43.1		
	121-180 min/day	32	37.5		
	181->300 min/day	26	34.6		
Other Activity (week)	0-104 min/wk	48	41.7	0.65	0.86
	105-208 min/wk	60	35.0		
	209-450 min/wk	56	46.4		
	451-2640 min/wk	56	39.3		
Self-Rate Physical Activity	Much to Somewhat More Active	146	31.5	0.04	0.14
	About the Same	57	29.8		
	Much to Somewhat Less Active	19	63.2		
Satisfaction with Medical Care	Completely to Reasonably Satisfied	144	34.0	<0.01	<0.01
	Borderline	49	42.9		
	Moderately to Extremely Unsatisfied	28	67.9		

[a]Where Applicable

(d) Table 75 shows the association between self-reported duty-related injuries and responses to questions that involved only specific Band groups. Among instrumentalists, longer weekly duration of playing the primary musical instrument and longer marching duration were associated with injury. Among vocalists, those who also reported dancing and more frequent singing and dancing were at higher injury risk. Among instrumentalists, vocalists, and conductors, those who spent more time standing, did not feel relaxed while performing, or deliberately tried to relax during playing or conducting were at higher injury risk.

Table 75. Association Between Self-Reported Duty-Related Injuries and Potential Risk Factors from Questionnaire Items That Involved Selected Groups

Group	Variable	Level of Variable	N	Proportion Injured (%)	Chi-Square p-Value	Linear Trend p-Value[a]
Instrumentalists	Years Playing Primary Musical Instrument	<6-20 years	42	33.3		
		21-26 years	49	55.1	0.17	0.42
		27-35 years	43	37.1		
		>35 years	37	29.7		
	Frequency of Playing Primary Instrument in Last Year	2-5 days/wk	45	33.3		
		6 days/wk	69	44.9	0.45	0.65
		7 days/wk	57	38.6		
	Duration of Playing Primary Musical Instrument in Last Year (session)	30-120 min	31	25.8		
		121-180 min	38	47.4		
		181-240 min	52	30.8	0.18	0.17
		241-300 min	30	46.7		
		>300 min	19	57.9		
	Duration of Playing Primary Musical Instrument in the Last Year (week)	225-900 min/wk	42	31.0	0.11	0.07
		901-1350 min/wk	42	40.5		
		1351-1680 min/wk	41	31.7		
		1681-3600 min/wk	45	53.3		
	Play Another Musical Instrument	No	91	40.7	0.80	____
		Yes	80	38.8		
	Frequency of Playing Other Musical Instrument	<1-2 days/wk	48	41.7		
		3-4 days/wk	11	18.2	0.32	0.89
		>4 days/wk	21	42.9		
	Duration of Playing other Musical Instrument	<30-60 min	35	40.0		
		61-120 min	23	47.8	0.36	0.42
		>120 min	22	27.3		
	Duration of Marching	0-<30 min	78	33.3		
		30-60 min	25	36.0	0.22	0.04
		61-120 min	39	46.2		
		>120 min	28	53.6		

Group	Variable	Level of Variable	N	Proportion Injured (%)	Chi-Square p-Value	Linear Trend p-Value[a]
Vocalists	Also Dance for Band	No	25	24.0	0.04	____
		Yes	8	62.5		
	Frequency of Singing/Dancing	3-5 days/wk	22	22.7	0.07	____
		6-7 days/wk	11	54.5		
	Duration of Singing/Dancing	30-120 min	19	31.6	0.80	____
		121-420 min	14	35.7		
Instrumentalists Vocalists Conductors	Duration of Standing	0-60 min	70	31.4		
		61-120 min	52	38.5	0.11	0.04
		121-180 min	45	35.6		
		>180 min	38	55.3		
	Wellness Instruction in Music School	No	155	38.1	0.94	____
		Yes	48	37.5		
	Wellness Instruction in Army	No	98	38.8	0.74	____
		Yes	105	36.2		
Instrumentalists Conductors	Feel Relaxed While Playing/Conducting	No	53	50.9	0.03	____
		Yes	118	33.1		
	Deliberately Relax While Playing/Conducting	No	50	28.0	0.05	____
		Yes	123	43.9		
Support	Frequency of Mission Set-up/Tear Down	0 days/wk	5	60.0	0.93	____
		3-5 days/wk	8	62.5		
	Duration of Mission Set-Up and Tear Down	0 min	7	42.9	0.77	____
		60-660 min	10	50.0		

[a]Where Applicable

(4) Risk Factors for Self-Reported Duty-Related Injuries (Multivariate).

(a) Multivariate logistic regression was performed for the combined male and female data using the variables in Tables 72 and 74. Because of the small sample sizes, conductors and administrative support personnel were not included in this analysis. Gender, unit, race, shoe problems, uniform problems, weekly duration of aerobic activity, weekly duration of strength training, satisfaction with medical care, and self-rated physical activity met the $p<0.25$ criteria for entry into the model. There were 201 Soldiers with complete data and 73% of them were correctly classified by the model. In the backward stepping procedure gender, unit, self-rated physical activity and satisfaction with medical care remained in the final model as shown in Table 76.

Table 76. Multivariate Logistic Regression Results from Backward Stepping Model With Duty-Related Injuries as Dependent Variable

Variable	Level of Variable	N	Odds Ratio (95%CI)	p-value
Gender	Men	163	1.00	----
	Women	45	4.20 (1.48-9.06)	<0.01
Unit	Chorus	25	1.00	----
	Blues	17	1.51 (0.32-7.11)	0.60
	Ceremonial	60	2.99 (0.91-9.87)	0.07
	Chorale	11	2.16 (0.35-13.24)	0.41
	Concert	62	1.51 (0.44-5.21)	0.51
	Strings	20	1.21 (0.24-5.91)	0.81
	Support (Staging/Audio)	13	8.42 (1.61-43.99)	0.01
Self-Rating of Physical Activity	Much to Somewhat More Active	140	1.00	----
	About the Same	50	0.92 (0.80-1.22)	0.14
	Much to Somewhat Less Active	18	2.25 (0.99-5.77)	0.05
Satisfaction with Medical Care	Completely to Reasonably Satisfied	135	1.00	----
	Borderline	46	1.53 (0.70-3.33)	0.29
	Moderately to Extremely Unsatisfied	27	4.21 (1.56-11.34)	<0.01

(b) A separate multivariate analysis was run to include the APFT data for the men only. This analysis included race, shoe problems, uniform problems, weekly duration of aerobic activity, weekly duration of strength training, self-rated physical activity, satisfaction with medical care, push-ups, sit-ups, and 2-mile run. The backward stepping procedure resulted in a model with 120 men with complete data and 66% of the men were correctly classified. Table 77 shows that independent risk factors included self-rated physical activity, satisfaction with medical care, and sit-ups.

Table 77. Multivariate Logistic Regression Results from Backward Stepping Model With Duty-Related Injuries as Dependent Variable and Hearing Questions Included

Variable	Level of Variable	N	Odds Ratio (95%CI)	p-value
Self-Rating of Physical Activity	Much to Somewhat More Active	83	1.00	----
	About the Same	27	0.46	0.15
	Much to Somewhat Less Active	10	1.15	0.28
Satisfaction with Medical Care	Completely to Reasonably Satisfied	70	1.00	----
	Borderline	31	1.30 (0.50-3.39)	0.59
	Moderately to Extremely Unsatisfied	19	4.47 (1.40-14.31)	0.01
Sit-ups	29-42 repetitions	18	1.00	----
	43-50 repetitions	33	1.86 (0.46-7.47)	0.38
	51-65 repetitions	31	1.04 (0.25-4.27)	0.96
	66-111 repetitions	38	3.56 (0.94-13.47)	0.06

(5) Risk Factors for Musculoskeletal Symptoms (Univariate).

(a) This analysis included all Band members who completed the questionnaire. Table 77 shows the results of the univariate chi square analysis examining associations between current musculoskeletal symptoms prevalence and various potential risk factors. For the variables "injured in 2004" only Soldiers present the entire year were considered in the analysis. Female gender, unit, age, and higher educational status were associated with higher musculoskeletal symptoms incidence.

Table 77. Association Between Self-Reported Musculoskeletal Symptoms Prevalence and Potential Risk Factors

Variable	Level of Variable	N	Proportion Reporting Symptoms (%)	Chi-Square p-value	Linear Trend p-value[a]
Gender	Men	176	60.8	0.07	----
	Women	48	75.0		
Unit	Strings	21	61.9		
	Blues	17	52.9		
	Chorus	28	46.4		
	Chorale	12	66.7	0.01	----
	Ceremonial	65	83.1		
	Concert	67	58.2		
	Officers	2	100.0		
	Support (Staging/Audio)	12	41.7		
Functional Group	Strings	33	63.6		
	Keyboard	5	60.0		
	Vocal	28	50.0	0.21	----
	Percussion	16	50.0		
	Brass	89	70.8		
	Woodwinds	39	69.2		
	Conductors	2	100.0		
	Support (Staging/Audio)	12	41.7		
Age	22.0-30.0 years	26	57.7		
	30.1-35.0 years	48	70.8		
	35.1-40.0 years	41	46.3	0.01	0.22
	40.1-45.0 years	40	67.5		
	45.1-50.0 years	37	54.1		
	>50.0 years	26	88.5		
Educational Status[b]	High School /Some College	39	59.0		
	Bachelor's Degree	78	53.8	0.02	----
	Master's Degree or Higher	93	74.2		
Martial Status[b]	Single	40	75.0		
	Married	157	61.8	0.29	----
	Other	18	61.1		
Race[b]	White	193	65.8		
	Black	16	50.0	0.32	----
	Other	9	77.8		

Variable	Level of Variable	N	Proportion Reporting Symptoms (%)	Chi-Square p-Value	Linear Trend p-Value[a]
Time In Service[b]	0.3-6.5 years	58	69.0		
	6.6-13.8 years	62	58.1	0.36	0.89
	13.9-19.6 years	53	58.5		
	19.7-34.1 years	51	70.6		
Time in Band[b]	0.1-4.7 years	40	77.5		
	4.8-9.6 years	46	56.5	0.17	0.38
	9.7-16.5 years	63	58.7		
	16.6-33.9 years	74	64.9		
Injury in 2004	No	117	60.7	0.21	----
	Yes	91	69.2		

[a]Where Applicable
[b]Does not include unknowns. In all cases, unknowns had little effect on p-values

(b) Table 78 shows the results of the univariate analysis examining associations between current musculoskeletal symptoms prevalence and potential risk factors relating to physical characteristics and physical fitness. In this analysis, men and women were separated because of the large gender differences in the independent variables (height, weight, fitness). Taller men had higher symptoms prevalence and there was a trend such that men who scored fewer APFT points were at higher risk. Among the women, greater symptoms risk was associated with shorter stature. There was also a suggestion that that women with slower 2-mile run times were at higher symptoms risk.

Table 78. Association Between Self-Reported Musculoskeletal Symptoms Prevalence and Potential Risk Factors Relating to Physical Characteristics and Physical Fitness

	Men					Women				
Variable	Level of Variable	N	Proportion Reporting Symptoms (%)	Chi-Square p-value	Linear Trend p-value	Level of Variable	N	Proportion Reporting Symptoms (%)	Chi-Square p-value	Linear Trend p-value
Height	64-68 inches	37	54.1			59-63 inches	12	100.0		
	69-70 inches	75	54.7	0.16	0.04	64-66 inches	24	66.7	0.07	0.06
	71-72 inches	41	70.7			67-69 inches	12	66.7		
	73-76 inches	23	73.9							
Weight	111-168 pounds	43	62.8			98-127 pounds	15	73.3		
	169-185 pounds	47	55.3	0.80	0.92	128-139 pounds	17	82.4	0.66	0.76
	186-204 pounds	43	65.1			140-190 pounds	16	68.8		
	205-264 pounds	43	60.5							

	Men					Women				
Variable	Level of Variable	N	Proportion Reporting Symptoms (%)	Chi-Square p-value	Linear Trend p-value	Level of Variable	N	Proportion Reporting Symptoms (%)	Chi-Square p-value	Linear Trend p-value
BMI	18.5-24.5 kg/m^2	37	64.9			17.1-21.1 kg/m^2	16	68.8		
	24.6-26.1 kg/m^2	48	64.6	0.79	0.49	21.2-23.8 kg/m^2	15	86.7	0.44	0.92
	26.2-28.2 kg/m^2	38	55.3			23.9-28.9 kg/m^2	13	69.2		
	28.3-36.8 kg/m^2	45	60.0							
Push-ups	20-39 repetitions	37	64.9			13-19 repetitions	18	77.8		
	40-42 repetitions	40	57.5	0.47	0.82	20-27 repetitions	10	60.0	0.59	0.79
	43-55 repetitions	42	52.4			28-50 repetitions	12	75.0		
	56-132 repetitions	57	66.7							
Sit-ups	29-42 repetitions	38	65.8			33-46 repetitions	13	84.6		
	43-50 repetitions	42	57.1	0.89	0.74	47-67 repetitions	15	73.3	0.55	0.29
	51-65 repetitions	38	60.5			68-90 repetitions	15	66.7		
	66-111 repetitions	58	60.3							
2-Mile Run	12.0-15.2 minutes	35	51.4			14.7-17.8 minutes	11	54.5		
	15.3-16.0 minutes	32	65.6	0.61	0.44	17.9-19.2 minutes	10	90.0	0.14	0.15
	16.1-17.1 minutes	34	64.7			19.3-22.8 minutes	11	81.8		
	17.2-18.8 minutes	36	61.1							
Total APFT Score	182-207 points	34	73.5			187-228 points	11	63.6		
	208-225 points	29	58.6	0.29	0.08	229-253 points	10	80.0	0.65	0.99
	226-253 points	35	54.3			254-300 points	11	63.6		
	254-300 points	34	52.9							

(c) Table 79 shows the association between current musculoskeletal symptoms prevalence and potential risk factors from the questionnaire. Higher injury risk was associated with complaints of shoe problems, complaints of uniform problems, less sports frequency, longer duration of "other" activity, less self-rated physical activity, and less satisfaction with medical care.

Table 79. Association Between Self-Reported Musculoskeletal Symptoms Prevalence and Potential Risk Factors from Questionnaire

Variable	Level of Variable	N	Proportion Reporting Symptoms (%)	Chi-Square p-Value	Linear Trend p-Value[a]
Shoe Problems	No	101	48.5	<0.01	___
	Yes	121	76.0		
Uniform Problems	No	100	49.0	<0.01	___
	Yes	121	76.0		
Aerobic Activity Frequency	0-1 day/wk	18	72.2		
	2-3 days/wk	128	64.8	0.60	0.32
	4-7 days/wk	78	60.3		
Aerobic Activity Duration (session)	0-14 min/day	8	75.0		
	15-30 min/day	46	71.7	0.50	0.28
	31-60 min/day	147	60.5		
	>60 min/day	23	65.2		
Aerobic Activity Duration (week)	0-88 min/wk	54	72.2	0.50	0.39
	89-152 min/wk	66	59.1		
	153-228 min/wk	46	63.0		
	229-536 min/wk	58	62.1		
Strength Training Frequency	0-1 day/wk	63	69.8		
	2-3 days/wk	116	64.7	0.21	0.09
	4-7 days/wk	45	53.5		
Strength Training Duration (session)	0-14 min/day	42	66.7		
	15-30 min/day	72	63.9	0.84	0.52
	31-60 min/day	90	64.4		
	>60 min/day	20	55.0		
Strength Training Duration (week)	0-38 min/wk	56	66.1	0.97	0.77
	39-88 min/wk	64	62.5		
	89-176 min/wk	48	64.6		
	177-536 min/wk	56	62.5		
Sports Frequency	0-1 day/wk	167	65.3		
	2-3 days/wk	32	71.9	0.07	0.13
	4-7 days/wk	25	44.0		

Variable	Level of Variable	N	Proportion Reporting Symptoms (%)	Chi-Square p-value	Linear Trend p-value[a]
Sports Duration (session)	0-14 min/day	99	67.7	0.12	0.23
	15-30 min/day	15	40.0		
	31-60 min/day	52	65.4		
	>60 min/day	27	51.9		
Sports Duration (week)	0-7 min/wk	102	67.6	0.27	0.24
	22-76 min/wk	46	54.3		
	77-536 min/wk	47	59.6		
Other Activity Frequency	0-1 day/wk	62	62.9	0.55	0.42
	2-3 days/wk	102	61.8		
	4-7 days/wk	57	70.2		
Other Activity Duration (session)	0-30 min/day	26	42.3	0.09	0.10
	31-60 min/day	82	64.6		
	61-120 min/day	53	73.6		
	121-180 min/day	32	62.5		
	181->300 min/day	27	70.4		
Other Activity Duration (week)	0-104 min/wk	49	57.1	0.12	0.12
	105-208 min/wk	59	57.6		
	209-450 min/wk	55	76.4		
	451-2640 min/wk	56	66.1		
Self-Rated Physical Activity	Much to Somewhat More Active	147	66.0	<0.01	0.63
	About the Same	55	50.9		
	Much to Somewhat Less Active	19	89.5		
Satisfaction with Medical Care	Completely to Reasonably Satisfied	145	59.3	0.11	0.09
	Borderline	48	75.0		
	Moderately to Extremely Unsatisfied	27	70.4		

[a]Where Applicable

(d) Table 80 shows the association between current musculoskeletal symptoms prevalence and responses to questions involving specific groups. Among the instrumentalists, the number of years playing the primary musical instrument (bimodal relationship), playing another instrument, and longer marching duration were associated with higher musculoskeletal symptoms prevalence. Among instrumentalists, vocalists or conductors, higher symptoms risk was associated with more time spent standing, not feeling relaxed while performing, or deliberately trying to relax during playing or conducting.

Table 80. Association Between Pain Prevalence and Potential Risk Factors from Questionnaire Items That Involved Selected Groups

Group	Variable	Level of Variable	N	Proportion Reporting Symptoms (%)	Chi-Square p-Value	Linear Trend p-Value[a]
Instrumentalists	Years Playing Primary Musical Instrument	<6-20 years	45	75.6	0.07	0.86
		21-26 years	49	63.3		
		27-35 years	44	54.5		
		>35 years	37	78.4		
	Frequency of Playing Primary Instrument in Last Year	2-5 days/wk	47	68.1	0.99	0.93
		6 days/wk	70	67.1		
		7 days/wk	58	67.2		
	Duration of Playing Primary Musical Instrument in Last Year (session)	30-120 min	31	64.5	0.91	0.85
		121-180 min	41	73.2		
		181-240 min	53	66.0		
		241-300 min	30	63.3		
		>300 min	19	68.4		
	Duration of Playing Primary Musical Instrument in the Last Year (week)	225-900 min/wk	43	69.8	0.96	0.87
		901-1350 min/wk	45	64.4		
		1351-1680 min/wk	41	68.3		
		1681-3600 min/wk	45	66.7		
	Play Another Musical Instrument	No	93	64.5	0.08	____
		Yes	82	70.7		
	Frequency of Playing Other Musical Instrument	<1-2 days/wk	49	71.4	0.95	0.83
		3-4 days/wk	12	66.7		
		>4 days/wk	21	71.4		
	Duration of Playing other Musical Instrument	<30-60 min	36	75.0	0.62	0.38
		61-120 min	23	73.9		
		>120 min	22	63.6		
	Duration of Marching	0-<30 min	79	54.4	0.01	<0.01
		30-60 min	26	69.2		
		61-120 min	41	80.5		
		>120 min	28	82.1		

Group	Variable	Level of Variable	N	Proportion Reporting Symptoms (%)	Chi-Square p-Value	Linear Trend p-Value[a]
Vocalists	Also Dance for Band	No Yes	26 9	46.2 66.7	0.14	____
	Frequency of Singing/Dancing	3-5 days/wk 6-7 days/wk	24 11	45.8 63.6	0.33	____
	Duration of Singing/Dancing	30-120 min 121-420 min	21 14	52.4 50.0	0.89	____
Instrumentalists Vocalists Conductors	Duration of Standing	0-60 min 61-120 min 121-180 min >180 min	73 54 46 38	53.4 61.5 71.7 84.2	<0.01	<0.01
	Wellness Instruction in Music School	No Yes	159 50	61.6 74.0	0.11	____
	Wellness Instruction in Army	No Yes	102 107	68.6 60.7	0.23	____
Instrumentalists Conductors	Feel Relaxed While Playing/Conducting	No Yes	54 121	79.6 62.0	0.01	____
	Deliberately Relax While Playing/Conducting	No Yes	52 125	55.8 72.8	<0.01	____
Support	Frequency of Mission Set-up/Tear Down	1-3 days/wk 4-5 days/wk	5 7	20.0 57.1	0.20	____
	Duration of Mission Set-Up and Tear Down	0 min 60-660 min	0 12	0 30.0	----	____

[a]Where Applicable

(6) Risk Factors for Musculoskeletal Symptoms (Multivariate).

(a) Multivariate logistic regression was performed for the combined male and female data using the variables in Tables 77 and 79. Because of the small sample sizes, conductors and administrative support personnel were not included in any multivariate analysis. Gender, unit, functional group, age, educational status, time in the band, injuries in 2004, shoe problems, uniform problems, strength training frequency, sports frequency, sports duration (session), other activity duration, self-rated physical activity, and satisfaction with medical care met the $p<0.25$ criteria for entry into the model. There were 177 Soldiers with complete data and 79% of them were correctly classified by the model. As shown in Table 81, the variables that remained in the

final backward stepping model were unit, older age, shoe problems, injury in 2004, and less self-rated physical activity.

Table 81. Multivariate Logistic Regression Results from Backward Stepping Model With Musculoskeletal Symptoms Prevalence as Dependent Variable

Variable	Level of Variable	N	Odds Ratio (95%CI)	p-value
Unit	Chorale	10	1.00	----
	Blues	15	5.28 (0.47-60.44)	0.20
	Ceremonial	51	19.24 (2.33-178.76)	<0.01
	Chorus	19	2.18 (0.23-21.31)	0.51
	Concert	52	1.52 (0.25-12.55)	0.69
	Strings	21	3.54 (0.39-28.50)	0.27
	Support (Staging/Audio)	9	6.05 (0.54-87.92)	0.18
Age	22.0-30.0 years	23	1.00	----
	30.1-35.0 years	37	2.14 (0.52-9.09)	0.30
	35.1-40.0 years	33	1.53 (0.28-5.17)	0.60
	40.1-45.0 years	34	5.35 (1.15-24.85)	0.03
	45.1-50.0 years	28	0.78 (0.20-4.14)	0.75
	>50.0 years	22	21.99 (3.03-153.27)	<0.01
Shoe Problems	No	87	1.00	----
	Yes	90	2.98 (1.19-7.06)	0.02
Injured in 2004	No	105	1.00	----
	Yes	72	2.57 (1.09-6.12)	0.04
Self-Rated Physical Activity	Much to Somewhat More Active	119	1.00	----
	About the Same	42	1.00 (0.45-3.09)	>0.99
	Much to Somewhat Less Active	16	9.32 (1.52-54.78)	0.02

(b) A separate multivariate analysis was run to include the APFT data for the men only. This analysis included unit, functional group, age, educational status, time in the Band, injuries in 2004, shoe problems, uniform problems, strength training frequency, sports frequency, sports duration (session), other activity duration, self-rated physical activity, satisfaction with medical care, and height. The backward stepping procedure resulted in a model with 132 men with complete data and 77% of the men were correctly classified. Height was not in the final model and the results were essentially the same as the model above without height.

g. Observations on Band Activities. After action reports on observations on Band activities are in Appendix E. These included two set-ups by the band support group (indoor and outdoor venues), two full honors funerals, a twilight tattoo, a major concert, a rehearsal, and a Memorial Day wreath laying at the Tomb of the Unknown Soldiers. Weight and size of some instruments are included in Appendix E.

8. DISCUSSION. This project provided a great deal of descriptive information on Band demographics, physical fitness, historical mission loads, injury rates, and risk factors for injuries. In 2005, the injury visit rates for men and women in the Band were 231 and 287 visits/100 person-years, respectively. There were 52% of men and 51% of women that experienced one or more injuries in 2005. Factors associated with many of the injury outcome measures included low physical activity, low physical fitness, prior injuries, unit, functional group, not feeling relaxed during performances, and complaints of shoe and uniform problems. Few of the Band members had yearly audiometric examinations and few consistently used hearing protection. In addition, focus group interviews suggested there were problems with the size and weight of some instruments and music notebooks, and some problems with chairs used by the Band members. Much of this information was used to provide suggestions that might reduce injuries in the Band. Before discussing these suggestions, it is useful to place the Band data in the context of the wider Army.

a. Comparisons of Band Physical Characteristics and Physical Fitness.

(1) Table 82 shows a comparison of the physical characteristics of the Band with those of a sample from the wider Army and a subsample of individuals aged 37-41 years (79). On average, Band men were taller and weighed more than both of the other samples and had a higher BMI. The physical characteristics of the Band women were similar to women in the broader Army and to the female subsample of comparable age.

Table 82. Comparison of Physical Characteristics of US Army Band to broader Army

	Men			Women		
	Band (n=209)	All Army (n=5346)[a]	Army 37to41 Year Olds (n=382)[a]	Band (n=55)	All Army (n=676)[a]	Army 37to41 Year Olds (n=34)[a]
Age (yrs)	39.9±7.7	27.6±7.0	38.7±1.4	38.6±8.3	27.5±6.0	38.2±1.3
Height (cm)	179.3±6.4	176.5±7.3	176.3±7.2	164.3±6.6	163.6±7.2	165.3±7.3
Weight (kg)	85.4±11.9	77.5±10.3	79.3±10.4	61.9±8.1	60.8±7.6	61.7±7.3
BMI (kg/m^2)	26.5±3.1	24.9[b]	25.5[b]	22.8±2.4	22.7[b]	22.6[b]

[a]From Reference 79
[b]Calculated from mean values; BMI not available in article

(2) Table 83 compares average APFT raw scores and total points of the Band to a wider Army sample (79). The raw scores for the Band men are lower than for the sample of men from the wider Army but, after age adjustment, the total points are higher for the Band men. When the Band men are compared to the Army-wide 37 to 41 year-old sample, the Band raw scores are slightly higher for push-ups and sit-ups with similar run times. This resulted in more total APFT points for the Band men compared to the Army-wide 37 to 41 year old sample.

(3) Results for the Band women are similar to those for the Band men with the notable exception of the 2-mile run comparison. As shown in Table 83, the raw scores for the Band women are lower than for the female all Army sample but, after age adjustment, the total points for the Band women are higher. When the Band women are compared to the Army-wide 37 to 41 year-old sample, the Band raw scores are higher on all 3 APFT events resulting in more total APFT points. Band women ran an average 0.9 minutes (5%) faster than the 37 to 41 year olds.

Table 83. Comparison of APFT Events of US Army Band and Wider Army Sample

	Men			Women		
	Band	All Army[a]	Army 37to41 Year Olds[a]	Band	All Army[a]	Army 37to41 Year Olds[a]
Push-Ups (reps)	47±14	50±13	44±12	26±10	28±11	23±13
Sit-Ups (reps)	54±15	59±13	51±13	58±16	59±13	50±16
2-Mile Run (min)	16.1±1.4	15.1±1.7	16.0±2.3	18.6±1.9	18.3±2.1	19.4±2.4
Total Score (points)	233±33	225[b]	224[b]	244±32	230[b]	231[b]

[a]From Reference 79; sample sizes vary because not all Soldiers completed all APFT events
[b]Calculated from individual event point scores in article; variance not available

(4) VO_2max of the Band members was estimated from the 2-mile run times in Table 83 using the Mello equation (80). For the men, the estimated VO_2max of the Band, all Army group, and the 37 to 41 year-olds are 45.8, 49.1 and 46.1 ml/kg/min, respectively. Comparable VO_2max values for the women are 40.0, 40.5, and 38.6 ml/kg/min, respectively. Shvartz and Reibold (81) reviewed studies reporting on VO_2max values for 98 male samples and 43 female samples (62 studies) and constructed a 7 point scale to describe aerobic fitness levels (excellent, very good, good, average, fair, poor, very poor). The VO_2max of the average male Band members fell between the categories of good and very good categories (about the 22nd percentile); the average female Band member was in the "very good" category (about the 11th percentile).

b. Injury Visits.

(1) The injury visit rate was higher for the women than for the men in both 2004 and 2005. However, the cumulative incidence of injury differed very little between men and women in these two years. This indicates that about the same proportion of men and women experienced injuries (one or more), but the women made more visits to medical care facilities for the injuries they experienced.

(2) In order to compare the injury visit rates (visits/100 person-years) in the Band to Army-wide rates, the 28 selected ICD-9 codes were queried in the outpatient Defense Medical Epidemiology Database (DMED) for years 2004 and 2005. For the DMED data, only the primary diagnosis (DX1) from medical treatment facilities in continental United States (CONUS) were considered. For the DMSS Band data, the DX1 was considered to correspond as closely as possible to the DMED Army-wide data. Men and women were analyzed separately. Denominators for calculation of Army-wide rates were obtained from the DMED. Denominators for the Band data were based on the total number of Soldiers in the Band in the respective years.

(3) Table 84 compares the 2004 and 2005 injury visit rates of the men in the Band to rates for men Army-wide. Overall male injury visit rates are shown in the last row of Tables 84.

Compared to the Army-wide rate, the Band rate was 16% lower in 2004 and 12% lower in 2005. For each ICD-9 code group, the male injury visit rate is generally lower in the Band compared to the wider Army (see columns labeled "Risk Ratios"). However, there are notable exceptions. ICD-9 groupings that were higher for the Band men in both 2004 and 2005 included 715-716 (osteoarthritis), 728 (disorders of muscle ligament and fascia), 736 (acquired deformities of limbs), 835-837 (lower body dislocations) and 959 (unspecific injuries).

(4) Tables 85 compares the 2004 and 2005 injury visit rates of the women in the Band to the rates for women Army-wide. Overall female injury visit rates are shown in the last row of Tables 85. Compared to the Army-wide injury visit rate, the Band injury visit rate was 23% lower in 2004 and 36% lower in 2005. For specific groupings of ICD-9 codes, the female injury visit rate was generally lower in the Band than the wider Army (see columns labeled "Risk Ratios"). Exceptions (where rates are higher for Band women in both 2004 and 2005) included 354-355 (neuritis), 726 (peripheral enthesopathies), 736 (acquired deformities of limbs), and 840-842 (sprains/strains of the upper body).

Table 84. Comparison by Specific ICD-9 Codes of Injury Visit Rates, Army Band vs. Army-Wide (Men) [a]

	Army-Wide 2004		Army-Wide 2005		Band 2004			Band 2005		
ICD-9 Code Groups	Visits (n)	Rate (/100)	Visits (n)	Rate (/100)	Visits (n)	Rate (/100)	Risk Ratios (Band/Army)	Visits (n)	Rate (/100)	Risk Ratios (Band/Army)
354-355 Neuritis	6,407	1.98	6,016	1.82	8	3.83	1.93	3	1.44	0.79
692 Contact dermatitis	14,958	4.62	14,509	4.83	10	4.78	1.03	4	1.91	0.44
715-716 Osteoarthritis	11,003	3.40	11,701	3.54	17	8.13	2.39	30	14.35	4.05
717-718 Internal derangement of joints	23,392	7.22	20,209	6.11	13	6.22	0.86	10	4.78	0.78
719 Unspecified joint disorders	120,062	37.06	112,097	33.87	89	42.58	1.15	50	23.92	0.71
721 Spondylosis	4,050	1.25	4,668	1.41	3	1.44	1.15	1	0.48	0.34
722 Intervertebral disk disorders	21,860	6.75	23,660	7.15	23	11.00	1.63	13	6.22	0.87
723-724 Other spinal disorders	107,709	33.25	100,613	30.40	54	25.84	0.78	111	53.11	1.75
726 Peripheral enthesopathies	31,465	9.71	29,494	8.91	18	8.61	0.89	19	9.09	1.02
727 Other disorders of synovium, tendon and bursa	13,769	4.25	13,191	3.99	13	6.22	1.46	5	2.39	0.60
728 Disorders of muscle, ligament, fascia	17,272	5.33	17,363	5.25	13	6.22	1.17	16	7.66	1.46
729 Other soft tissue disorders	36,246	11.19	31,407	9.49	36	17.22	1.54	19	9.09	0.96
733 Other bone, joint disorders	12,086	3.73	12,182	3.68	0	-	-	3	1.44	3.89
736 Acquired deformities of limbs	2,579	0.80	2,990	0.90	8	3.83	4.79	13	6.22	6.91
739 Nonallopathic lesions	26,114	8.06	20,272	6.12	10	4.78	0.59	6	2.87	0.47
805-818 Upper body Fracture	17,488	5.40	17,099	5.17	1	0.48	0.09	10	4.78	0.92
820-829 Lower body Fracture	13,213	4.08	12,145	3.67	0	-	-	2	0.96	0.26
835-837 Lower body dislocation	6,262	1.93	5,233	1.58	10	4.78	2.48	6	2.87	1.82
840-842 Sprains/strains upper body	16,754	5.17	16,686	5.04	11	5.26	1.02	6	2.87	0.57
843-845 Strains/sprains lower body	53,989	16.67	52,082	15.74	14	6.70	0.40	24	11.48	0.73
846-847 Strains/sprains back	22,746	7.02	21,690	6.55	13	6.22	0.89	10	4.78	0.73
848 Strains/sprains other	9,375	2.89	8,357	2.53	2	0.96	0.33	7	3.35	1.33
870-897 Open wounds	6,262	1.93	5,667	1.71	4	1.91	0.99	6	2.87	1.68
910-919 Abrasions	13,951	4.31	13,265	4.01	3	1.44	0.33	3	1.44	0.36
920-924 Contusions	18,738	5.78	16,434	4.97	4	1.91	0.33	5	2.39	0.48
940-949 Burns	1,893	0.58	2,077	0.63	0	-	-	1	0.48	0.76
959 Unspecified injuries	11,983	3.70	8,383	2.53	10	4.78	1.29	9	4.31	1.70
V Codes V57.1, V57.2, or V67.4	280,796	86.68	274,416	82.91	111	53.11	0.61	91	43.54	0.53
Overall	922,422	284.73	873,906	264.04	498	238.28	0.84	483	231.10	0.88

Table 85. Comparison by Specific ICD-9 Codes Of Injury Visit Rates, Army Band vs. Army-Wide (Women)[a]

	Army-Wide 2004		Army-Wide 2005		Band 2004			Band 2005		
ICD-9 Code Groups	Visits (n)	Rate (/100)	Visits (n)	Rate (/100)	Visits (n)	Rate (/100)	Risk Ratio (Band/Army)	Visits (n)	Rate (/100)	Risk Ratio (Band/Army)
354-355 Neuritis	2,634	4.79	2,559	4.80	15	27.27	5.64	6	10.91	2.27
692 Contact dermatitis	4,005	7.28	3,927	7.37	5	9.09	1.25	1	1.82	0.25
715-716 Osteoarthritis	2,422	4.40	2,297	4.31	0	-	-	0	-	-
717-718 Internal derangement of the knee	5,167	9.39	3,845	7.21	5	9.09	0.97	2	3.64	0.50
719 Unspecified joint disorders	36,992	67.22	35,428	66.46	14	25.45	0.33	26	47.27	0.71
721 Spondylosis	926	1.68	905	1.70	0	-	-	0	-	-
722 Intervertebral disk disorders	3,561	6.47	3,500	6.57	1	1.82	0.28	0	-	-
723-724 Other spinal disorders	30,756	55.89	27,228	51.08	18	30.73	0.59	29	52.73	1.03
726 Peripheral enthesopathies	9,230	16.77	7,955	14.92	15	27.27	1.63	18	32.73	2.19
727 Other disorders of synovium, tendon and bursa	6,060	11.01	5,110	9.59	4	7.27	0.66	2	3.64	0.38
728 Disorders of muscle, ligament, fascia	6,000	10.90	5,542	10.40	4	7.27	0.67	4	7.27	0.70
729 Other soft tissue disorders	11,463	20.83	11,532	21.63	31	56.36	2.71	11	20.00	0.92
733 Other bone, joint disorders	10,086	18.33	7,451	13.98	5	9.09	0.50	2	3.64	0.26
736 Acquired deformities of limbs	797	1.45	916	1.72	13	23.60	16.30	2	3.64	2.12
739 Nonallopathic lesions	9,488	17.24	7,372	13.82	8	14.53	0.84	0	-	-
805-818 Upper body Fracture	1,844	3.35	1,868	3.50	0	-	-	5	9.09	2.60
820-829 Lower body Fracture	2,345	4.26	2,242	4.21	0	-	-	0	-	-
835-837 Lower body dislocation	1,105	2.09	1,849	1.59	0	-	-	0	-	-
840-842 Sprains/strains upper body	2,707	4.92	2,692	5.05	2	3.64	0.74	5	9.09	1.80
843-845 Strains/sprains lower body	14,671	26.66	13,155	24.68	17	30.91	1.16	2	3.64	0.15
846-847 Strains/sprains back	6,702	12.18	5,701	10.69	4	7.27	0.60	6	10.91	1.02
848 Strains/sprains other	2,335	4.24	2,014	3.78	0	-	-	1	1.82	0.48
870-897 Open wounds	1,105	2.09	535	1.00	0	-	-	2	3.64	3.64
910-919 Abrasions	3,569	6.49	3,370	6.32	1	1.82	0.28	1	1.82	0.29
920-924 Contusions	4,105	7.46	3,520	6.60	1	1.82	0.24	2	3.64	0.55
940-949 Burns	456	0.83	432	0.81	0	-	-	0	-	-
959 Unspecified injuries	1,920	3.49	1,474	2.77	0	-	-	6	10.91	3.94
V Codes V57.1, V57.2, or V67.4	80,198	145.72	74,192	139.18	40	72.73	0.50	25	45.45	0.33
Overall	262,649	477.25	238,611	447.61	203	369.09	0.77	158	287.27	0.64

[a]Army-wide rates are for continental United States, primary diagnosis, all occurrences

(5) Because Band members were older than most Soldiers, separate comparisons were made 1) between the Band Soldiers and all Soldiers ≥30 years of age and 2) between Band Soldiers and all Soldiers ≥35 years of age. The proportions of men and women in the Band and in the entire Army for these age groups is shown in Table 86.

Table 86. Proportion of All Soldiers by Age Groups (numbers in table are %)

Group	Men		Women	
	≥30 years	≥35 years	≥30 years	≥35 years
Band	85	64	76	54
Entire Army	38	23	34	20

(6) Table 87 compares the 2004 and 2005 injury visit rates of all the men in the Band to rates for all Army men ≥30 years of age for selected groupings of ICD-9 codes. Overall male injury visit rates are shown in the last row of Tables 87. Compared to the Army-wide rate, the Band injury visit rate was 26% lower in both 2004 and 2005. For each of the 28 ICD-9 code groups, the male injury visit rate is generally lower in the Band compared to men Army-wide (see columns labeled "Risk Ratios"). ICD-9 groupings that are higher for the Band in both 2004 and 2005 include 715-716 (osteoarthritis), 729 (other soft tissue disorders), 736 (acquired deformities of limbs), 835-837 (lower body dislocations) and 959 (unspecific injuries). Thus, the Band results for the men are very similar to comparisons Army-wide except that overall injury visit rates are somewhat lower for the Band.

(7) Tables 88 compares the 2004 and 2005 injury visit rates of the women in the Band (from the DMSS) to the injury visit rate for Army women ≥30 of age (from DMED) for selected groupings of ICD-9 codes. Overall female injury visit rates are shown in the last row of Tables 88. Compared to the Army-wide injury visit rate, the Band injury visit rate was 27% lower in 2004 and 39% lower in 2005. For each of the specific groupings of ICD-9 codes, the female injury visit rate was generally lower in the Band than Army-wide (see columns labeled "Risk Ratios"). Exceptions (where rates are higher for the Band in both 2004 and 2005) included 354-355 (neuritis), 726 (peripheral enthesopathies), 729 (other soft tissue disorders), and 736 (acquired deformities of limbs). As with the men, comparison of injury rates between women in the Band and women 30 years of age and older were very similar to comparisons with women in the Band and all Army women. The female Band injury rate was lower than both all women in the Army and Army women 30 years of age and older.

Table 87. Comparison by Specific ICD-9 Codes of Injury Visit Rates, Army Band vs. Army (Men)[a] ages 30+

ICD-9 Code Groups	Army-Wide 2004 (n=323,964)[a]		Army-Wide 2005 (n=330,977)[a]		Band 2004 (n=209)			Band 2005 (n=209)		
	Visits (n)	Rate (/100)	Visits (n)	Rate (/100)	Visits (n)	Rate (/100)	Risk Ratios (Band/ Army)	Visits (n)	Rate (/100)	Risk Ratios (Band/Army)
354-355 Neuritis	3,852	3.10	3,732	3.00	8	3.83	1.24	3	1.44	0.48
692 Contact dermatitis	4,508	3.63	4,576	3.67	10	4.78	1.32	4	1.91	0.52
715-716 Osteoarthritis	8,000	6.44	8,296	6.66	17	8.13	1.26	30	14.35	2.15
717-718 Internal derangement of joints	10,361	8.34	8,790	7.06	13	6.22	0.75	10	4.78	0.68
719 Unspecified joint disorders	44,057	35.47	42,849	34.41	89	42.58	1.20	50	23.92	0.70
721 Spondylosis	3,313	2.67	3,622	2.91	3	1.44	0.54	1	0.48	0.16
722 Intervertebral disk disorders	16,438	13.24	17,645	14.17	23	11.00	0.83	13	6.22	0.44
723-724 Other spinal disorders	53,456	43.04	51,252	41.15	54	25.84	0.60	111	53.11	1.29
726 Peripheral enthesopathies	16,350	13.16	15,618	12.54	18	8.61	0.65	19	9.09	0.72
727 Other disorders of synovium, tendon and bursa	6,906	5.56	6,869	5.52	13	6.22	1.12	5	2.39	0.43
728 Disorders of muscle, ligament, fascia	8,430	6.79	8,835	7.09	13	6.22	0.92	16	7.66	1.08
729 Other soft tissue disorders	12,323	9.92	10,726	8.61	36	17.22	1.74	19	9.09	1.06
733 Other bone, joint disorders	2,896	2.33	3,315	2.66	0	-	-	3	1.44	0.54
736 Acquired deformities of limbs	1,191	0.96	1,406	1.13	8	3.83	3.99	13	6.22	5.50
739 Nonallopathic lesions	16,260	13.09	13,380	10.74	10	4.78	0.37	6	2.87	0.27
805-818 Upper body Fracture	5,398	4.35	5,650	4.54	1	0.48	0.11	10	4.78	1.05
820-829 Lower body Fracture	4,179	3.36	3,965	3.18	0	-	-	2	0.96	0.30
835-837 Lower body dislocation	3,276	2.64	2,903	2.33	10	4.78	1.81	6	2.87	1.23
840-842 Sprains/strains upper body	6,810	5.48	7,090	5.69	11	5.26	0.96	6	2.87	0.50
843-845 Strains/sprains lower body	14,116	11.37	14,046	11.28	14	6.70	0.59	24	11.48	1.02
846-847 Strains/sprains back	9,063	7.30	8,742	7.02	13	6.22	0.85	10	4.78	0.68
848 Strains/sprains other	3,106	2.50	2,918	2.34	2	0.96	0.38	7	3.35	1.43
870-897 Open wounds	5,073	4.08	5,475	4.40	4	1.91	0.47	6	2.87	0.65
910-919 Abrasions	3,357	2.70	3,220	2.59	3	1.44	0.53	3	1.44	0.56
920-924 Contusions	4,689	3.78	4,274	3.43	4	1.91	0.51	5	2.39	0.70
940-949 Burns	549	0.44	595	0.48	0	-	-	1	0.48	1.00
959 Unspecified injuries	3,652	2.94	3,101	2.49	10	4.78	1.63	9	4.31	1.73
V Codes V57.1, V57.2, or V67.4	130,514	105.09	125,298	100.61	111	53.11	0.51	91	43.54	0.43
Overall	402,123	323.79	388,188	311.70	498	238.28	0.74	483	231.10	0.74

[a]Army-wide rates are for continental United States, primary diagnosis, all occurrences

Table 88. Comparison by Specific ICD-9 Codes of Injury Visit Rates, Army Band vs. Army (Women)[a] ages 30+

	Army-Wide 2004		Army-Wide 2005		Band 2004			Band 2005		
ICD-9 Code Groups	Visits (n)	Rate (/100)	Visits (n)	Rate (/100)	Visits (n)	Rate (/100)	Risk Ratio (Band/Army)	Visits (n)	Rate (/100)	Risk Ratio (Band/Army)
354-355 Neuritis	1,614	8.66	1,564	8.56	15	27.27	3.15	6	10.91	1.27
692 Contact dermatitis	1,233	6.61	1,213	6.64	5	9.09	1.38	1	1.82	0.27
715-716 Osteoarthritis	1,611	8.64	1,525	8.35	0	-	-	0	-	-
717-718 Internal derangement of the knee	1,993	10.69	1,441	7.89	5	9.09	0.85	2	3.64	0.46
719 Unspecified joint disorders	10,496	56.29	9,712	53.15	14	25.45	0.45	26	47.27	0.89
721 Spondylosis	681	3.65	687	3.76	0	-	-	0	-	-
722 Intervertebral disk disorders	2,410	12.93	2,379	13.02	1	1.82	0.14	0	-	-
723-724 Other spinal disorders	11,707	62.79	11,347	62.10	18	30.73	0.49	29	52.73	0.85
726 Peripheral enthesopathies	3,534	18.95	3,223	17.64	15	27.27	1.44	18	32.73	1.86
727 Other disorders of synovium, tendon and bursa	2,530	13.57	2,258	12.36	4	7.27	0.54	2	3.64	0.29
728 Disorders of muscle, ligament, fascia	2,578	13.83	2,438	13.34	4	7.27	0.53	4	7.27	0.54
729 Other soft tissue disorders	4,214	22.60	3,596	19.68	31	56.36	2.49	11	20.00	1.02
733 Other bone, joint disorders	1,399	7.50	1,368	7.49	5	9.09	1.21	2	3.64	0.49
736 Acquired deformities of limbs	296	1.59	357	1.95	13	23.60	14.84	2	3.64	1.87
739 Nonallopathic lesions	4,549	24.40	3,361	18.39	8	14.53	0.60	0	-	-
805-818 Upper body Fracture	534	2.86	651	3.56	0	-	-	5	9.09	2.55
820-829 Lower body Fracture	811	4.35	737	4.03	0	-	-	0	-	-
835-837 Lower body dislocation	557	2.99	393	2.15	0	-	-	0	-	-
840-842 Sprains/strains upper body	988	5.30	983	5.38	2	3.64	0.69	5	9.09	1.69
843-845 Strains/sprains lower body	3,049	16.35	2,792	15.28	17	30.91	1.89	2	3.64	0.24
846-847 Strains/sprains back	2,588	13.88	2,042	11.18	4	7.27	0.52	6	10.91	0.98
848 Strains/sprains other	603	3.23	538	2.94	0	-	-	1	1.82	0.62
870-897 Open wounds	521	2.79	432	2.36	0	-	-	2	3.64	1.54
910-919 Abrasions	695	3.73	698	3.82	1	1.82	0.49	1	1.82	0.48
920-924 Contusions	892	4.78	823	4.50	1	1.82	0.38	2	3.64	0.81
940-949 Burns	94	0.50	110	0.60	0	-	-	0	-	-
959 Unspecified injuries	557	2.99	488	2.67	0	-	-	6	10.91	4.09
V Codes V57.1, V57.2, or V67.4	31,558	169.25	28,389	155.37	40	72.73	0.43	25	45.45	0.29
Overall	94,292	505.70	85,545	468.18	203	369.09	0.73	158	287.27	0.61

(8) Table 89 compares the 2004 and 2005 injury visit rates of all men in the Band (from the DMSS) to the injury rate for all Army men ≥35 years of age (from DMED) for selected groupings of ICD-9 codes. Overall male injury visit rates are shown in the last row of Tables 89. Compared to the Army-wide rate, the Band rate was 32% lower in 2004 and 33% lower 2005. For each of the 28 ICD-9 code groups, the male injury visit rate was generally lower in the Band compared to the Army-wide group (see columns labeled "Risk Ratios"). ICD-9 grouping that were higher for the Band in both 2004 and 2005 included 729 (other soft tissue disorders), 736 (acquired deformities of limbs), 835-837 (lower body dislocations) and 959 (unspecific injuries). Thus, comparison of injury rates between men in the Band and all Army men ≥35 years of age was very similar to the other comparisons above.

(9) Table 90 compares the 2004 and 2005 injury visit rates of the women in the Band (from the DMSS) to the injury visit rate for Army women ≥35 of age (from DMED) for selected groupings of ICD-9 codes. Overall female injury visit rates are shown in the last row of Table 90. Compared to the Army-wide injury visit rate, the Band injury visit rate was 32% lower in 2004 and 44% lower in 2005. For each specific group of ICD-9 codes, the female injury visit rate was generally lower in the Band than Army wide (see columns labeled "Risk Ratios"). Exceptions (where rates were higher for the Band in both 2004 and 2005) included 354-355 (neuritis), 726 (peripheral enthesopathies), 729 (other soft tissue disorders), and 736 (acquired deformities of limbs). As with the men, comparison of injury rates between women in the Band and women ≥35 years of age and older were very similar to comparisons with women in the Band and all Army women.

Table 88. Comparison by Specific ICD-9 Codes of Injury Visit Rates, Army Band vs. Army (Men)[a] Ages 35+

ICD-9 Code Groups	Army-Wide 2004 (n=323,964)		Army-Wide 2005 (n=330,977)		Band 2004 (n=209)			Band 2005 (n=209)		
	Visits (n)	Rate (/100)	Visits (n)	Rate (/100)	Visits (n)	Rate (/100)	Risk Ratios (Band/Army)	Visits (n)	Rate (/100)	Risk Ratios (Band/Army)
354-355 Neuritis	2,853	3.87	2,861	3.87	8	3.83	0.99	3	1.44	0.37
692 Contact dermatitis	2,832	3.84	2,867	3.88	10	4.78	1.24	4	1.91	0.49
715-716 Osteoarthritis	6,436	8.74	6,799	9.21	17	8.13	0.93	30	14.35	1.56
717-718 Internal derangement of joints	6,355	8.63	5,572	7.54	13	6.22	0.72	10	4.78	0.63
719 Unspecified joint disorders	27,259	37.00	27,156	36.77	89	42.58	1.15	50	23.92	0.65
721 Spondylosis	2,640	3.58	2,797	3.79	3	1.44	0.40	1	0.48	0.13
722 Intervertebral disk disorders	12,490	16.95	13,282	17.98	23	11.00	0.65	13	6.22	0.35
723-724 Other spinal disorders	36,405	49.42	35,318	47.82	54	25.84	0.52	111	53.11	1.11
726 Peripheral enthesopathies	11,877	16.12	11,247	15.23	18	8.61	0.53	19	9.09	0.60
727 Other disorders of synovium, tendon and bursa	4,669	6.34	4,706	6.37	13	6.22	0.98	5	2.39	0.38
728 Disorders of muscle, ligament, fascia	5,477	7.43	5,857	7.93	13	6.22	0.84	16	7.66	0.97
729 Other soft tissue disorders	7,753	10.52	6,545	8.86	36	17.22	1.64	19	9.09	1.03
733 Other bone, joint disorders	1,545	2.10	1,886	2.55	0	-	-	3	1.44	0.56
736 Acquired deformities of limbs	783	1.06	935	1.27	8	3.83	3.61	13	6.22	4.90
739 Nonallopathic lesions	11,251	15.27	9,686	13.12	10	4.78	0.31	6	2.87	0.22
805-818 Upper body Fracture	3,066	4.16	3,146	4.26	1	0.48	0.12	10	4.78	1.12
820-829 Lower body Fracture	2,163	2.94	2,088	2.83	0	-	-	2	0.96	0.34
835-837 Lower body dislocation	2,184	2.96	1,917	2.60	10	4.78	1.61	6	2.87	1.10
840-842 Sprains/strains upper body	4,254	5.77	4,376	5.93	11	5.26	0.91	6	2.87	0.48
843-845 Strains/sprains lower body	7,190	9.76	7,354	9.96	14	6.70	0.69	24	11.48	1.15
846-847 Strains/sprains back	5,608	7.61	5,314	7.20	13	6.22	0.82	10	4.78	0.66
848 Strains/sprains other	1,727	2.34	1,610	2.18	2	0.96	0.41	7	3.35	1.54
870-897 Open wounds	2,686	3.65	3,044	4.12	4	1.91	0.52	6	2.87	0.70
910-919 Abrasions	1,765	2.40	1,722	2.33	3	1.44	0.60	3	1.44	0.62
920-924 Contusions	2,392	3.25	2,262	3.06	4	1.91	0.59	5	2.39	0.78
940-949 Burns	266	0.36	333	0.45	0	-	-	1	0.48	1.07
959 Unspecified injuries	2,054	2.79	1,833	2.48	10	4.78	1.71	9	4.31	1.74
V Codes V57.1, V57.2, or V67.4	83,759	113.70	81,029	109.72	111	53.11	0.47	91	43.54	0.40
Overall	259,739	352.56	253,542	343.31	498	238.28	0.68	483	231.10	0.67

[a]Army-wide rates are for continental United States, primary diagnosis, all occurrences

Table 90. Comparison by Specific ICD-9 Codes of Injury Visit Rates, Army Band vs. Army (Women)[a] ages 35+

	Army-Wide 2004 (n=10,748)		Army-Wide 2005 (n=10,732)		Band 2004 (n=55)			Band 2005 (n=55)		
ICD-9 Code Groups	Visits (n)	Rate (/100)	Visits (n)	Rate (/100)	Visits (n)	Rate (/100)	Risk Ratio (Band/Army)	Visits (n)	Rate (/100)	Risk Ratio (Band/Army)
354-355 Neuritis	1,083	10.08	1,141	10.63	15	27.27	2.71	6	10.91	1.03
692 Contact dermatitis	711	6.62	704	6.56	5	9.09	1.37	1	1.82	0.28
715-716 Osteoarthritis	1,363	12.68	1,272	11.85	0	-	-	0	-	-
717-718 Internal derangement of the knee	1,157	10.76	912	8.50	5	9.09	0.84	2	3.64	0.43
719 Unspecified joint disorders	6,043	56.22	5,765	53.72	14	25.45	0.45	26	47.27	0.88
721 Spondylosis	528	4.91	552	5.14	0	-	-	0	-	-
722 Intervertebral disk disorders	1,742	16.21	1,693	15.78	1	1.82	0.11	0	-	-
723-724 Other spinal disorders	7,228	67.25	7,370	68.67	18	30.73	0.46	29	52.73	0.77
726 Peripheral enthesopathies	2,436	22.66	2,205	20.55	15	27.27	1.20	18	32.73	1.59
727 Other disorders of synovium, tendon and bursa	1,587	14.77	1,499	13.97	4	7.27	0.49	2	3.64	0.26
728 Disorders of muscle, ligament, fascia	1,612	15.00	1,623	15.12	4	7.27	0.48	4	7.27	0.48
729 Other soft tissue disorders	2,605	24.24	2,092	19.49	31	56.36	2.33	11	20.00	1.03
733 Other bone, joint disorders	615	5.72	692	6.45	5	9.09	1.59	2	3.64	0.56
736 Acquired deformities of limbs	196	1.82	236	2.20	13	23.60	12.97	2	3.64	1.65
739 Nonallopathic lesions	3,017	28.07	2,279	21.24	8	14.53	0.52	0	-	-
805-818 Upper body Fracture	259	2.41	356	3.32	0	-	-	5	9.09	2.74
820-829 Lower body Fracture	467	4.34	435	4.05	0	-	-	0	-	-
835-837 Lower body dislocation	429	3.99	293	2.73	0	-	-	0	-	-
840-842 Sprains/strains upper body	566	5.27	625	5.82	2	3.64	0.69	5	9.09	1.56
843-845 Strains/sprains lower body	1,404	13.06	1,402	13.06	17	30.91	2.37	2	3.64	0.28
846-847 Strains/sprains back	1,577	14.67	1,282	11.95	4	7.27	0.50	6	10.91	0.91
848 Strains/sprains other	324	3.01	279	2.60	0	-	-	1	1.82	0.70
870-897 Open wounds	285	2.65	244	2.27	0	-	-	2	3.64	1.60
910-919 Abrasions	318	2.96	336	3.13	1	1.82	0.61	1	1.82	0.58
920-924 Contusions	438	4.08	441	4.11	1	1.82	0.45	2	3.64	0.89
940-949 Burns	57	0.53	59	0.55	0	-	-	0	-	-
959 Unspecified injuries	307	2.86	283	2.64	0	-	-	6	10.91	4.13
V Codes V57.1, V57.2, or V67.4	20,288	188.76	18,861	175.75	40	72.73	0.39	25	45.45	0.26
Overall	58,642	545.60	54,931	511.85	203	369.09	0.68	158	287.27	0.56

[a]Army-wide rates are for continental United States, primary diagnosis, all occurrences

c. Injury Incidence and Injury Risk Factors.

(1) Although the injury visit rate was lower than for the Army in general, the cumulative injury incidence was still relatively high with over half of the Band members experienced one or more injuries in 2005. Other military occupational specialties (MOS) where injury incidences have been examined include infantrymen, (82, 83) armor crewmen (84), military police (85), combat engineers (86, 87), field artillerymen (87), and wheel vehicle mechanics (88, 89). Caution must be exercised in comparing the injury incidences and rates in these studies to data collected in the present study. Most of the previous studies obtained their incidence data from medical records screening rather than from the DMSS SADR data. A previous study (90) showed that incidence data obtained from these two sources can differ considerably. One study of basic trainees (91) did use SADR data and calculated injury rates in manner similar to the present project. However, basic trainees differ from Band members in terms of age, fitness, and the types and amounts of physical activity performed (92).

(2) One group that may be roughly comparable on the basis of age are students at the US Army War College (93). War College students are senior military officers (lieutenant-colonel and colonels) with an average age of about 44 years who are active in sports and exercise activity and twice a year must meet fitness standards (the APFT) that are similar to those for Band members. In the War College group, cumulative injury incidence was 56% in one academic year and 44% in a second academic year after introduction of injury prevention interventions. Although this War College study also collected injury data from medical records, cumulative incidence was similar to the present study which found rates of 46% and 51% (2004 and 2005, respectively).

(3) In addition to quantifying the injury visit rate and annual injury incidence, this project identified a number of risk factors associated with injuries. The risk factors differed somewhat depending on whether the outcome measure was documented injuries, self-reported duty-related injuries or self-reported musculoskeletal symptoms. Injury risk factors that were common across two or more outcome measures included gender, low physical activity, low physical fitness, prior injuries, unit, functional group, not feeling relaxed during performances, and complaints of shoe and uniform problems.

(4) An association between a particular variable and an injury outcome measure does not imply a cause and effect relationship such that changing the factor will necessarily reduce injuries (94, 95). Nonetheless, an association between a variable and injury outcome can provide clues as to possible interventions that might assist in reducing injuries in the Band.

d. Prior Injury.

(1) Prior injury in 2004 was independently associated with documented injury in 2005. A previous study of injuries among officers at the Army War College also showed a relationship between injuries officers sustained at the War College and those they incurred in the 4 years prior to attending the War College (93). However, activities performed by officers while they were at the War College were likely to have been different from activities performed by these same officers in the previous 4 years. In the present study, Band members were likely to have performed very similar activities in 2004 and 2005. Studies of athletes (96-100), industrial workers (101) and military groups (102) have reported that prior injuries were associated with current injuries, especially if an injury had occurred in the preceding year (97-100). Many injuries may be chronic or recurrent, accounting for at least a part of this relationship.

(2) An analysis was performed of Band Soldiers who had prior injuries in 2004 to examine the possibility that these injuries were chronic or recurrent. The criterion for a chronic or recurrent injury was an identical or similar ICD-9 code in both 2004 and 2005. A "similar" ICD-9 code could involve 1) an anatomical location with a diagnosis in one year with an implied anatomical location and a similar diagnosis in another year (e.g., degenerated lumbar disc vs. lumbago), 2) a similar diagnosis in both years (e.g., fasciitis, unspecified vs. plantar fasciitis), or 3) an anatomic location with an injury in one year and possible "carry over" effects into the next year implied by the same anatomical location (e.g., ruptured tendon, foot vs. arthralgia, foot). There were 60 men and 15 women with a prior injury in 2004. Of these, 35 men and 8 women appeared to have similar or identical ICD-9 codes and these are shown in Tables 91 and 92 for men and women, respectively. Thus, 57% (43/75) of Band members appeared to have injuries in 2005 that might be considered similar or identical to those seen in 2004.

Table 91. ICD-9 Codes Similar in 2004 and 2005 (Men)

Soldier	2004		2005	
	ICD-9 Code	Description	ICD-9 Code	Description
1.	719.46	Arthralgia-lower leg	719.46	Arthralgia-lower leg
	836.1	Tear lateral cartilage or meniscus of knee, current	836.0	Tear medial cartilage or meniscus of knee, current
2.	354.0	Carpal tunnel syndrome	354.0	Carpal tunnel syndrome
	717.7	Chondromalacia patella	717.7	Chondromalacia of patella
3.	719.46	Arthralgia-lower leg	719.46	Arthralgia-lower leg
4.	847.9	Sprains and strains, back NOS	847.9	Sprains, strains back NOS
	722.52	Degenerate lumbar or lumbosacral intervertebral disc	724.2	Lumbago
5.	724.6	Disorders sacrum	724.6	Disorders sacrum
6.	719.41	Arthralgia, shoulder	719.41	Arthralgia, shoulder
7.	719.41	Arthralgia, shoulder	719.41	Arthralgia, shoulder
	719.45	Arthralgia, pelvic region, thigh	719.45	Arthralgia, pelvic region, thigh
	726.32	Enthesopathy, lateral epicondylitis	726.32	Enthesopathy, lateral epicondylitis
	729.1	Myalgia, myositis, NOS	719.40	Arthralgia-site unspec
8.	723.1	Cervicalgia	723.1	cervicalgia
	724.1	Pain, thoracic spine	724.1	Pain, thoracic spine
9.	729.9	Polyalgia	729.9	polyalgia
	848.8	Sprains, strains, other specific sites	848.8	Sprains, strains, other spec sites
	840.9	Sprains, strains unspecified site shoulder, upper arm	726.2	Peripheral enthesopathy-other affections, shoulder
10.	724.5	Backache, unspecified	724.2	Lumbago
11.	724.2	Lumbago	724.2	Lumbago
12.	727.68	Rupture nontraumatic, other tendons foot, ankle	719.47	Arthralgia-ankle, foot
	355.5	Tarsal tunnel syndrome	355.5	Tarsal tunnel syndrome
13.	715.96	Osteoarthritis, unspecified, lower leg	715.90	Osteoarthritis, unspecified, general or local.
14.	726.10	Disorders of bursae, tendons, shoulder unspecified	726.10	Disorders of bursae, tendons, shoulder unspecified
15.	719.46	Arthralgia-low leg	719.46	Arthralgia-low leg
16.	724.2	Lumbago	724.8	Other sympt. back
17.	728.71	Plantar fascial fibromatosis	728.71	Plantar fascial fibromatosis
18.	715.96	Osteoarthritis, unspecified, lower leg	715.96	Osteoarthritis, unspecified, lower leg

	717.7	Chondromalacia patella	717.7	Chondromalacia patella
	719.46	Arthralgia-low leg	719.46	Arthralgia-low leg
	717.9	Unspecified internal derangement of knee	717.9	Unspecified internal derangement of knee
	836.2	Other tear of cart or meniscus knee, current	836.2	Other tear of cart or meniscus knee, current
19.	719.41	Arthralgia-shoulder	719.41	Arthralgia-shoulder
	847.1	Sprains, strains, thoracic	847.1	Sprains, strains, thoracic
	846.1	Sprains, strains sacroiliac ligament	846.1	Sprains, strains sacroiliac ligament
	739.2	Non-allopath lesions, unspecified, thoracic region	739.2	Non-allopath lesions, unspecified, thoracic region
	724.2	Lumbago	724.2	Lumbago
	726.10	Disorders of bursae, tendons, shoulder, unspecified	726.10	Disorders of bursae, tendons, shoulder, unspecified
20.	719.46	Arthralgia-low leg	719.46	Arthralgia-low leg
21.	722.52	Degeneration lumbar or lumbosacral disc	722.52	Degeneration lumbar or lumbosacral disc
22.	724.5	Backache, unspec	724.2	Lumbago
23.	719.46	Arthralgia-low leg	736.70	Unspecified acquired deformity of ankle/foot
24.	719.47	Arthralgia-ankle and foot	719.47	Arthralgia-ankle and foot
	845.00	Sprains, strains ankle, unspecified site	845.00	Sprains, strains ankle, unspecified site
25.	723.1	Cervicalgia	723.1	Cervicalgia
	722.0	Displaced cervical intervertebral disc	722.4	Degenerated cervical intervertebral disc
	840.7	Sprains, strains sup glenoid labrum lesion	726.2	Other affections shoulder, unspecified
26.	846.0	Sprains, strains lumbosacral joint	724.2	Lumbago
27.	716.95	Arthropathy, unspecified-pelvic region, thigh	716.95	Arthropathy, unspecified-pelvic region, thigh
	719.45	Arthralgia-pelvic region, thigh	719.45	Arthralgia-pelvic region, thigh
28.	721.90	Spondylosis unspecified site-w/out myelopathy	721.90	Spondylosis unspecified site-w/out myelopathy
	724.5	Backache, unspecified	724.2	Lumbago
29.	722.0	Displaced cervical intervertebral disc	722.0	Displaced cervical intervertebral disc
	723.1	Cervicalgia	723.1	Cervicalgia
	723.4	Brachial neuritis or radiculitis, unspecified	723.4	Brachial neuritis or radiculitis, unspecified

30.	719.46	Arthralgia-low leg	719.46	Arthralgia-low leg
31.	719.46	Arthralgia, low leg	719.46	Arthralgia, low leg
	844.9	Sprains, strains unspec site knee, leg	844.9	Sprains, strains unspec site knee, leg
32.	729.4	Fasciitis, unspecified	728.71	Plantar fascial fibromatosis
33.	729.5	Pain in limb	729.5	Pain in limb
34.	735.4	Acquired hammer toe	735.4	Acquired hammer toe
35.	736.79	Other acquired deformities, ankle, foot	736.79	Other acquired deformities, ankle, foot

Table 92. ICD-9 Codes Similar in 2004 and 2005 (Women)

Soldier	2004		2005	
	ICD-9 Code	Text	ICD-9 Code	Text
1.	728.71	Plantar fascial fibromatosis	728.71	Plantar fascial fibromatosis
2.	723.1	Cervicalgia	723.1	Cervicalgia
	724.2	Lumbago	724.2	Lumbago
	729.9	Polyalgia	729.9	Polyalgia
3.	729.5	Pain in limb	729.5	Pain in limb
4.	354.2	Mononeuritis, upper limb-lesion, ulnar nerve	354.2	Mononeuritis, upper limb-lesion, ulnar nerve
	722.0	Displacement cervical intervertebral disc	724.5	Backache, unspecified
5.	736.79	Other acquired deformities, ankle, foot	736.79	Other acquired deformities, ankle, foot
6.	724.2	Lumbago	724.2	Lumbago
7.	846.9	Sprains, strains, unspecified site sacroiliac region	846.9	Sprains, strains, unspecified site, sacroiliac region
8.	845.00	Sprains, strains, ankle, unspecified site	845.00	Sprains, strains, ankle, unspecified site
	845.09	Sprains, strains ankle, foot-other	719.47	Arthralgia-ankle and foot

e. Recommendations for Reducing Injuries.

(1) Recommendations for reducing injuries were made on the basis of 3 major criteria. These criteria and the rating scale for each are shown in Table 93. Use of the rating scales involved some subjective judgments but objective criteria were utilized to the greatest extent possible.

(2) The first criterion for making a recommendation was indication of a problem. This meant simply that the data collected on the Band had to indicate that a problem existed. Indication of a problem could be denoted by 1) an association between a factor and injury or symptoms, 2) a questionnaire response that, based on past literature, suggested an injury or symptoms problem, or 3) focus group responses that, based on past literature, suggested an injury or symptoms problem. If a problem was found to exist but there were no actionable interventions available, that problem was not further considered in this analysis (although the problem was still cited in the results).

(3) The second criterion for making a recommendation was the effectiveness of the intervention. If an intervention was found to exist, the literature was searched to find articles or data demonstrating that the intervention was effective in reducing injuries. If no effectiveness literature was found, the intervention strength was judged low (these interventions could be based on presumed effectiveness or limited clinical experience). If at least one study or data set indicated efficacy for the intervention, the strength was judged moderate. If several studies indicated efficacy, the strength was judged high. For conflicting data, the weight of the evidence was considered.

(4) The third criterion for making a recommendation was the expense of the intervention. Expense of the intervention was based on a consideration of the resources required by the Band Commander both in terms of cost and time. If the resources required existed within the military system and would cost the Commander little or nothing, the expense was judged low. If some resources were required, the cost was judged moderate. If a considerable amount of resources were required, the cost was judged high.

Table 93. Criteria For Recommendations

CRITERIA	Indication of a Problem	Effectiveness of Intervention	Expense of Intervention
RATING SCALES	High Moderate Low	High Moderate Low	High Moderate Low

(5) Based on these 3 criteria, three recommendation levels were established: High, Moderate and Low. Table 94 shows a summary of the major recommendations for reducing injuries and symptoms. Details on the criteria are discussed below.

Table 94. Summary of Recommendations and Criteria Ratings

Intervention	Evidence of a Problem	Effectiveness of Intervention	Expense of Intervention	Recommendation Level
Increase Physical Activity and Physical Fitness	High	High	Low	High
Provide Ear Protection	High	Moderate	High	Moderate
Conduct Annual Hearing Tests	High	High	Low	High
Reduce Environmental Heat Exposures	Moderate	High	Low	High
Provide Ergonomic Devices to Reduce Instrument Problems	High	Moderate	High	Moderate
Provide Functional Movement and Pain Management Training	Moderate	High	Moderate	Moderate
Reducing Standing/Marching	Moderate	Low	Low	Moderate
Provide Appropriate Shoes	High	Low	High	Low
Provide Uniforms for Hot/Humid Conditions	High	Low	High	Low
Change Chairs	Low	Low	High	Low

(a) Increase Physical Activity and Physical Fitness.

i. In focus group interviews, Soldiers mentioned that performing too much physical training was a risk factor for injury. Some others mentioned training for the APFT as a risk factor. Some of these Soldiers reported that they trained just before the APFT in order to pass the test. Several measures of physical activity were risk factors for injury or pain prevalence. Less self-rated physical activity was an independent risk factor for documented injury in 2005, and also a risk factor in the univariate analysis for duty-related injury and symptoms prevalence. Less frequent "other" activity was associated with both document injury and with symptoms prevalence. Less frequent sports activity was associated with musculoskeletal symptoms prevalence. While these self-reported activity measures were varied, the overall findings provide support for the idea that less physical activity (of a variety of types) was associated with higher injury incidence and musculoskeletal symptoms prevalence among Band members. This data is in consonance with other studies showing lower physical activity was associated with higher injury rates (103-107)

ii. Besides lower physical activity, lower physical fitness was also generally associated with documented injury and playing related injury. Men and women were separated in the analysis of the fitness and physical characteristics data because of large gender-specific differences in these variables. For documented injuries, men with higher BMI and slower 2-mile run times were at higher risk. When only the first and last quartiles were examined, men performing fewer push-ups and sit-ups were also at higher risk. Presumably because of the much smaller sample size, such a relationship could not be demonstrated statistically in the women, but the patterns were similar to the men. Data is in consonance with the broad body of evidence showing that low physical fitness is associated with injuries in diverse military groups (82-85, 104, 106). Increasing physical activity and physical fitness has been shown to reduce injury incidence (108).

iii. Physical activity of the proper mode, intensity, frequency and duration leads to increased physical fitness (109). Increasing physical activity and physical fitness has been shown to reduce injuries (108). Thus, it is recommended that the Band increase the amount of

physical activity in Band members that are less physically active and less physically fit. This suggestion was targeted to individuals performing less physical activity and those of low fitness because overall, the Band was actually somewhat more fit than a comparable Army-wide age group.

(b) Provide Enhanced Hearing Protection/Conduct Annual Hearing Tests.

i. Questionnaire data indicated that during practice, rehearsal, and performance, <5% of Soldiers reported always wearing hearing protection, 52% reported sometimes wearing hearing protection, and 39% reported never wearing hearing protection. This was despite the fact that 81% were at least somewhat concerned about hearing loss. Most Soldiers thought that hearing protection interfered with their ability to monitor their performance (83%) or that of others (72%). Almost all (89%) Soldiers said they would use devices that protected their hearing and also enhanced their ability to hear others and monitor their performance.

ii. As noted in the Results, 26% (69/264) of Band members did not have a single audiometric record in the DOEHRS-HC database and almost half had no test after 2001. During the focus group interviews, the concert and volunteer groups mentioned they desired regular hearing tests. Also during the focus group interviews, the ceremonial and volunteer groups mentioned their proximity to weapons firing by the Old Guard as a potential risk factor for hearing problems.

iii. In 1983 the Occupational Safety and Health Administration (OSHA) implemented rules requiring the use hearing protective devices, monitoring of workplace noise levels, employee training, and annual audiometric monitoring (110). The proportion (%) of noise-induced threshold shift patterns (STS) and confirmed noise-induced threshold shift patterns (PTS) has progressively declined over the years suggesting that this multifaceted program has been effective (111).

iv. Two recommendations are made. The first is to provide hearing protection. High fidelity earplugs for musicians are available (112). Suppliers of conventional hearing protections for musicians include Etymontics Research (http://www.etymotic.com/ default.aspx) and Westone Laboratories (http://www.westone.com/). Sensaphonics (http://www.sensaphonics.com/prod_musicians.html) provides enhanced hearing protection with sensitive microphones embedded or attached to universal fit or custom soft gel silicon earpieces. Various systems provided by this company presumably preserve sound quality while allowing volume control of ambient sound input. An increase in the distance from the weapons firing of the Old Guard could reduce risk of hearing loss in the absence of hearing protection.

v. The second recommendation is to provide annual audiometric monitoring by having personnel report for scheduled testing, including any follow-up testing for significant threshold

shift. Since many Band members do not currently use hearing protection, audiometric monitoring is essential to detect hearing loss before it becomes a communication handicap.

(c) Reduce Environmental Heat Exposure.

i. Problems with environmental heat and humidity were mentioned in 5 of 11 focus group interviews. Problems related to heat and humidity were mentioned by 26% (64/243) of Band members on the open-ended questions, although many of these responses were in relation to other issues (shoes, uniforms, etc.). Examination of documented injuries in 2004 and 2005 revealed no specific heat-related injuries.

ii. Heat is produced by the body through normal resting metabolism and increases with increased muscular activity. Heat is dissipated through four major mechanisms, radiation, conduction, convection and evaporation. Radiation is the dissipation of heat through the body's emission of electromagnetic heat waves. Heat loss by radiation involves the fact that body temperature is greater than the environmental temperature so that a temperature gradient is established and heat moves from the warmer body to the cooler environment. If the environment is warmer than the body, the body will absorb the heat given off by the environment, especially from solar radiation. Conduction involves the transfer of heat from one substance to another through direct molecular contact. In conductive heat loss, heat is transferred through the tissue molecules of the body to air molecules on the surface of the body. Convection involves heat loss as the result of the movement of air across the body. If there is a breeze or wind, the warmer air next to the body is moved away (convected) and replaced by cooler air. Evaporation is the major physiological mechanism for cooling the body during physical activity. Evaporation involves the transfer of heat to the environment by the evaporation of water from respiration and sweat. One liter of evaporated sweat results in a heat loss of 580 kilocalories (53, 113).

iii. The Band has no major heat-related problems as suggested by the fact that no heat-related injuries were found in 2004 and 2005 in the DMSS data. However, heat and humidity were a concern for many Band members and should be addressed for that reason. Heat and humidity-related complaints may be reduced by appropriate behavioral modifications and by reducing environmental exposures. Soldiers should hydrate according to evidence-based Army guidelines (114, 115) in Table 95 and observe Wet-Bulb Globe Temperature (WGBT) guidelines for light work. Soldiers should stay in cooler environments as long as possible prior to an event to reduce body heat accumulation (116, 117). Soldiers should operate in the shade whenever possible to reduce the heat load from solar radiation. When possible, Soldiers should avoid hot surfaces such as asphalt and marble to reduce the conductive heat load. Areas where breezes are available should be sought whenever possible to increase convective heat loss. Normally, acclimatization to heat should not be a problem for the Band given their residence in the Washington DC area, but on days when the temperature change from one day to the next is sudden or when the temperature/humidity are high, particular care should be exercised. With

consecutive days of at least 1-2 hours of exposure to the heat, about 40% of acclimatization will occur in 3 days, 80% in 5 days, and full acclimatization in 8-10 days (113, 118, 119).

Table 95. Recommendations for Work Duration and Fluid Replacement in Warm Weather (119)

Heat Category	WBGT Index (°F)	Easy Work		Moderate Work		Hard Work	
		Work Time (min)	Water Intake[b] (qts/hr)	Work Time (min)	Water Intake (qts/hr)	Work Time (min)	Water Intake (qts/hr)
1	78.0-81.9	NL[a]	½	NL	¾	70	1
2 (green)	82.0-84.9	NL	½	150	1	65	1¼
3 (yellow)	85.0-87.9	NL	¾	100	1	55	1¼
4 (red)	88.0-89.9	NL	¾	80	1¼	50	1¼
5 (black)	≥90	180	1	70	1½	45	1½

[a]NL=no limit; can sustain work for at least 4 hours in the specified heat category
[b]Fluid needs can vary based on individual differences (±1/4 qt/hr) and exposure to full sun or full shade (±1/4 qt/hr)

(d) Provide Ergonomic Devices to Reduce Instrument Problems.

i. Instrument and equipment problems were mentioned in all 11 of the focus group interviews. Heavy instruments and/or holding instruments for prolonged periods of time were mentioned as potential risk factors for injuries and/or pain in 7 of the 11 the focus group interviews. Additional problems noted in focus groups or in open-ended questions included lifting instruments, the size of some instruments and, for the chorale and chorus, prolonged holding of music notebooks. "Ergonomic" job modifications were independently mentioned as a way to reduce these risks by 7 band members.

ii. There is evidence that shifting loads from smaller muscle groups to larger muscle groups will increase comfort and allow for longer performance times (120-123). Shifting of loads can be accomplished with straps, harnesses, and various support devices. Also, subjecting portions of the body to high load pressures can result in discomfort, circulatory occlusion, and paresthesis (124-126). Load shifting or distributing the load over larger portions of the body may increase comfort and reduce injury (127-130). Table 96 shows websites for some user-centered devices that are generally designed to better distribute the weight of the instrument on the body. Table 97 shows websites for devices that allow wider distribution of the instrument weight (thumb rests and guides) or less angulation of the neck (violin and viola shoulder rests).

Finally, Table 98 presents a few companies that provide modified instruments that might increase comfort during practice and performance.

Table 96. Straps, Harnesses and Supports for Musical Instruments

Item	Company	Website
Strap harnesses for guitar, percussion, saxophone, and other instruments	Slider	http://www.slider-straps.com/
Supports for oboe, English horn, clarinet, saxophone, bassoon	Quodlibet	www.quodlibet.com/
Rigid drum harness		bluebootmusic.misupply.com/Pearl-RMMVTB-Magnesium-Vest-TUBE-Bass-Drum-Carrier-i83005.music
Guitar Straps	Active Musician Active Musician CourroieYstrap	www.activemusician.com/item--EM.CSPBL www.activemusician.com/item--EM.CSPGL pages.videotron.com/ystrap/
Tuba strap harness	Woodwind and Basswind	www.wwbw.com/Meinl-Weston-Tuba-Strap-i68898.music
Saxophone strap harnesses	Woodwind and Basswind Music123 Woodwind and Basswind Saxophone.com Active Musician Giardinelli	www.wwbw.com/Meinl-Weston-Tuba-Strap-i68898.music www.music123.com/Neotech-Soft-Harness-Strap-i20200.music www.wwbw.com/Oleg-Ergonomic-Sax-Strap-or-Harness-i84845.music www.saxophone.com/index.asp?PageAction=VIEWCATS&Category=22 www.activemusician.com/item--MC.SHS-B www.giardinelli.com/accessories/navigation?q=harnesses
Clarinet/Oboe supports	Linearworks	www.panclarinet.com.au/
Bassoon harness	Woodwind and Basswind	http://www.wwbw.com/BG-Bassoon-Harness-i85908.music
Accordion harness	Active Musician	http://www.activemusician.com/item--MC.AHBK
Bassoon, English horn and oboe stands	Forrest	www.forrestsmusic.com/instrument_stands.htm

Item	Company	Website
French horn strap	Clebsch Strap	www.clebschstrap.com/
Gel pads for Violin/Viola	Gel Rest	www.gelrest.com/
Trumpet support	Shulman System	www.shulmansystem.com/
Marching Drum Harness	Pearl MacLeod Highland	www.pearldrum.com/Pearl2006NewMarchingProducts.htm www.scotbagpipes.com/acatalog/DRUM_HARNESSES_AND_CARRIERS.html

Table 97. Instrument rest devices

Device	Company	Website
Guitar neck rests	Hamre Music	www.neckup.com/Merchant2/merchant.mvc
Thumb rests for oboe, clarinet, saxophone, flute	Ton Kooiman	www.tonkooiman.com/
Viola/violin shoulder rests	Sharmusic.com Musiciansfriend.com Hickey's Music Online	www.sharmusic.com/search2.asp?track_search=Y&SKW=shoulder+rests http://www.musiciansfriend.com/home/navigation?q=violin+rests http://www.hickeys.com/cgi/display.cgi?page=vnrest.htm
Flute and piccolo thumb guide	Music 123	www.music123.com/bo-pep-thumb-guide-i86073.music

Table 98. Instrument modifications

Device	Company	Website
Guitar and Bass	Little Guitar Works	www.littleguitarworks.com/
Violin/viola	David Rivinus	www.rivinus-instruments.com/
Flute	John Lunn	www.johnlunn.com/lunnflutes/21.htm

iii. Chorale and chorus members complained that prolonged holding of notebooks containing music could cause pain and/or considerable discomfort during performances. Using music stands for notebooks could be useful. A list of manufactures and websites containing stands for holding notebooks is in Table 99.

Table 99. Music Stands

Company	Website
Mister Standman	www.misterstandman.com/thestnds.htm
Anderson Music Stands	www.andersonmusicstand.com/
Alden Lee Company	www.aldenlee.com/musicstands.html
Musician's Friend	www.musiciansfriend.com/home/navigation/music-stands-music-stands-general-accessories?N=100001+305358
Ergo Boy	http://ergoboy.com/catalog/index.php?categories_id=522&osCsid=bfa7abd5c862

(e) Provide Functional Movement and Pain Management Training.

i. Sixty-four percent of Band members reported pain/soreness or discomfort associated with their duties. Not feeling relaxed while playing and deliberately trying to relax while performing were both risk factors for duty-related injury and musculoskeletal symptoms prevalence. While this may seem contradictory (not feeling relaxed and deliberately trying to relax), it may be that those who do not feel relaxed and attempt to do so may be attempting to relax inappropriately, thus increasing injury and musculoskeletal symptoms. This may suggest the need for the development of appropriate techniques to reduce muscle tension.

ii. Some studies have suggested that teaching Feldenkrais and/or Alexander technique may assist in developing appropriate relaxation strategies while reducing musculoskeletal symptoms and improving functional performance. Both techniques have been used by instrumentalists and vocalists in other musical groups (32, 44, 131). Both techniques purport to teach how to use the body more efficiently with less effort.

iii. Feldenkrais Method uses two types of training, "awareness though movement" (ATM) and functional integration (FI). ATM sessions guide students to become more aware of their body movements by exploring body position and use of their bodies. In functional integration (FI) training the instructor uses touch to facilitate the movement and awareness. Alexander technique is similar but the emphasis is placed on the head, neck and spine as the primary control (PC) areas with the lower limbs receiving less emphasis. Alexander technique uses processes called 'direction' and "inhibition. "Direction" is used to presumably send conscious motor commands to influence tonic muscular activity. "Inhibition" is used to prevent automatic muscular responses that have developed in the client over time in response to specific cues. Feldenkrais Method and Alexander Techniques are designed to increase movement

awareness and allow the student to develop movement patterns that minimize pain and discomfort while allowing improved performance. Alexander Technique developed in association with singing performances, possibly explaining the emphasis on the PC area; Feldenkrais Method developed from an interest in more athletic movement patterns. Both techniques are taught by instructors that require 1200 to 1600 hours of training for certification (132-134).

iv. Jains et al (133) lays out some of the difficulties in designing studies to evaluate Feldenkrais method and Alexander technique. These include "expense and time of the practitioner, prolonged length of time needed to conduct the studies, the difficulty in establishing a control group that meets regularly and receives placebo or sham treatment sessions, the difficulty in having a blinded treatment protocol with hand-on treatment, obtaining a large sample size that is randomized, controlling for variability in technique among practitioners, and using objective standardized outcome measures". While these factors must be kept in mind, studies that have examined Feldenkrais Method and Alexander Technique have generally indicated positive results.

v. Studies on Feldenkrais Method show improvements in neck range of motion (135), postural control, and balance, as well as reductions in back (132), neck, and shoulder pain (136, 137). Reductions in electromyographic activity and the perceived effort of movement was measured after single Feldenkrais sessions (138, 139). In symptomatic patients, reductions in musculoskeletal symptoms achieved through Feldenkrais techniques are greater and longer lasting than those achieved through traditional therapies (136, 137, 140). However, one study found no difference in rotational flexibility, balance or perceived energy level between groups of elderly retirement home personnel who were assigned to either 6 weeks of Feldenkrais training or 6 weeks of traditional exercise training (walking, running in place, calisthenics); however, the Feldenkrais group reported 1) less worry about health, 2) greater health improvements, and 3) reported sleeping better (141). In one study (139) the authors concluded there was no statistically significant change in the functional reach of symptomatic patients after a single Feldenkrais lesson; however, the group receiving the lesson (n=12) actually improved their functional reach by 13% ($p<0.10$) compared to a sham treatment group (n=11) that decreased their reach by 5% (139). Hamstring flexibility does not appear to be affected by exercises elicited by listening to Feldenkrais tapes (142).

vi. There are fewer studies on Alexander Technique but those available show long-lasting reductions in self-reported disability among Parkinson's disease patients (143, 144), improvements in functional reach (145), improvements in respiratory function (146), improved body mechanics, and less effort in moving (147, 148).

vii. Appendix I contains abstracts of studies on Feldenkrais Method and Alexander Technique that provide more information on each study than the summary above.

viii. The weight of evidence suggests that Feldenkrais Method may have long-lasting effects in reducing musculoskeletal symptoms and may improve some aspects of physical performance. There are fewer studies on Alexander Techniques but those available generally support improvements in function. Given that 64% of the Band reported duty-related pain, it may be beneficial to provide Feldenkrais lessons to Band members.

(f) Reduce Standing and Marching/Use Insoles.

i. Longer standing durations and longer marching durations were associated with both duty-related injuries and musculoskeletal symptoms prevalence. The ceremonial unit performed most of the standing and marching and this unit had the highest musculoskeletal symptoms prevalence and the third highest incidence of duty-related injuries. The ceremonial unit ranked only sixth in terms of the incidence of documented injuries in 2005. Less marching time was a risk factor for documented injuries but this may have been because those with documented injuries were more likely to be on profile and perform less standing. This could not be confirmed because the DMSS data did not contain profile data.

ii. Discomfort from prolonged standing is presumably due to a combination of venous pooling, sustained isometric muscle contractions, and nociceptive muscle afferent input due to the accumulation of metabolites (149-151), although there is some disagreement (152). Possible ways of reducing discomfort and fatigue are either through the use of mats or shoe insoles. During standing, softer floor surfaces have been shown to reduce discomfort compared to harder flooring surfaces (149, 150, 153, 154). Mats that have higher elasticity, less energy absorption, more stiffness and are less likely to "bottom out" generally result in less discomfort and fatigue (149, 154, 155). However, differences between floor mats in discomfort and/or fatigue are generally not apparent until after 3 or more hours of standing (154, 155). Studies of times shorter than 3 hours have shown no major effects (152). The ceremonial band is seldom standing in one location for periods over 3 hours, although 19% of the instrumentalists and 12% of the vocalists reported standing an average of over 3 hours during practices, rehearsals and performances. A major disadvantage of floor mats is that, they would have to be set up by the support unit adding another task to their operations.

iii. Studies on viscoelastic shoe insoles show that the reductions in fatigue and discomfort are similar to those achieved using floor mats (154, 156). Viscoelastic insoles have been shown to reduce force transients experienced during heel strikes while walking (157, 158). They also appear to reduce overall pain, the duration of post-work pain, and the frequency of pain during the day (159, 160). On the other hand, viscoelastic insoles do not appear to influence injury rates (105, 161). Despite the lack of evidence on injury reduction, the reductions in pain, fatigue and discomfort during prolonged standing are favorable qualities that could be of benefit to Band members, especially in light of the relatively high musculoskeletal symptoms prevalence in this group. Given the mobile nature of the Band, viscoelastic shoe insoles may be a more practical solution than floor mats for reducing symptoms.

iv. In addition to insoles, other practical suggestions should be considered. When possible, the amount of standing and marching should be reduced to possibly decrease musculoskeletal symptoms prevalence. We observed that buses often transported ceremonial unit members and this is a practice already in place that should continue. Rotating ceremonial band members with concert players (as suggested independently by 15 Band members) may also assist in reducing symptoms in ceremonial Band members. Allowing sitting during long performances was recommended independently by 12 separate band members.

(g) Provide Appropriate Shoes.

i. In focus group interviews one of the most common complaints from Band members concerned shoes. Shoe problems were mentioned in 7 of the 11 focus group interviews and replacing shoes with a more appropriate model was mentioned as a way to reduce problems in 5 of the 11 focus group interviews. Because shoe problems were a major item during the focus group interviews, a question on shoes was included on the questionnaire. On the questionnaire, over 50% of the Band members noted problems with their footwear. It was primarily the ceremonial and chorale units that had the most problems with over 75% of these groups complaining of footwear difficulties. The responses to the open-ended question on shoe problems echoed responses during the focus group interviews. Soldiers noted that shoes were lacking in flexibility, lacking in cushioning and support, that they did not appear to be designed for standing or marching, and that they were extremely uncomfortable in hot weather. Chorale members noted that the shoes were not designed for dancing. While shoe problems were not a risk marker for documented injury in 2005, they were a significant risk marker for self-reported duty-related injury and musculoskeletal symptoms prevalence. The foot and toes were the anatomic locations with the greatest number of Band profiles in the 2000 to 2005 period.

ii. These survey responses suggest that the current shoes pose a problem and that alternatives for the current footwear be investigated. However, there is little data indicating that modifying footwear can reduce injuries or improve comfort. With regard to running shoes, there have been two case studies (162, 163), two descriptive epidemiological studies (105, 164) and one experimental study examining injuries in running shoes (165). There is an association between older running shoes and increased incidence of stress fractures during Marine Corps recruit training (105). One case study suggested an association between lower shock absorbency and stress fractures (162), and there is a known mileage-related loss of shock absorbency in running shoes (166).

iii. Tables 100 and 101 show manufacturers that provide shoes specifically designed for marching bands. Also shown in Table 100 are some patent leather shoe models produced by these manufacturers. While patent leather produces a high shine, they do not provide ventilation that might increase comfort in the heat. Table 102 shows some other shoe manufacturers from which other Band members had purchased shoes they found to be comfortable (from focus group interviews and/or open ended question on shoes).

Table 100. Manufactures Specializing in Band Shoes

Company	Website	Comments
Drillmaster Corporation	www.drillmaster.com	Free pair of shoes to Band Director
Dinkles	www.dinkles.com	See "Formal" brand for patent leather
Director's Showcase	Dshowcase.com	See "Showstopper" brand for patent leather
Style Plus	www.styleplusband.com	See "Pinnacle" brand for patent leather
Bando Shoes	www.bandoshoes.com/home.cfm	See "Black Patent EXT" and "Prowler" brands

Table 101. Other Shoe Manufactures

Company	Website	Comments
Ecco	eccousa.com	
Merrell	www.merrell.com/main.aspx	
Dansko	www.dansko.com/home.aspx	
Clarks	www.clarksusa.com	

Table 102. Manufactures or Suppliers of Dance Shoes

Company	Website	Comments
Show Time	www.showtimedanceshoes.com	
Werner-Kern	www.werner-kern.com	
Aida	www.aidadancewear.com	
Dance Naturals	www.dancenaturals-usa.com	
Champion	www.championdanceshoes	General supplier

(h) Provide Uniforms for Hot/Humid Conditions.

i. Seven of 11 focus groups mentioned problems with uniforms and 7 of 11 focus groups also suggested specific uniform modifications. On the questionnaires, over 50% of the Band members noted that they had problems with their uniforms. About 75% of the ceremonial and chorale units and 80% of the strings unit reported problems. In both the focus group interviews and on the open-ended responses on the questionnaire, the main uniform problems had to do with uniforms that were too hot in the summer, collars that interfered with playing of some

instruments and collars that were "restrictive". Uniform problems were not a risk marker for documented injury in 2005, but they were a significant risk marker for self-reported duty-related injury and musculoskeletal symptoms prevalence.

ii. These survey data suggest that problems with the current uniforms exist and that alternatives for the current uniforms be considered. A large majority of the problems cited in the open-ended questions had to do with uniforms that were too hot in the summer and thus the development of cooler uniforms should be explored. Clothing influences heat transfer from the body to the environment in a very complex manner. Important factors include the fabric thickness, fiber type, fabric structure, fabric finish, color, and construction. With regard to fabric thickness, clothing serves as an insulating layer on the body, reducing evaporative and convective heat transfer to the external environment. Thinner clothing traps less metabolically heated air and thus is more desirable in hotter environments. Smooth clothing fibers may be less likely to trap heat and thus may feel cooler. Synthetic fibers (e.g., polyester, rayon) are smooth and long compared to natural fabrics like cotton and wool which are rougher. Many synthetic fibers are also hydrophobic and this may assist in evaporative cooling by moving moisture away from the body by capillary action (also referred to as "wicking"). In capillary action, moisture is progressively moved by metabolic heat from one fiber to another to the surface of the material since individual fibers have little capacity to hold moisture. Fabric structures that are more flexible and porous may allow more moisture and air exchange for more efficient convective and evaporative heat loss. Fabric finishes (e.g., waterproofing, water repellency) are likely to trap moisture and reduce air exchange and are contraindicated for clothing designed for hot environments. Generally, lighter colors absorb less heat radiated from the environment compared to darker colors and should be favored for hotter environments. Finally, the large-scale structure of the clothing should allow for ventilation and heat exchange. Open collars, looser cuffs, and strategically placed ventilation holes are advantageous in this regard. Movement creates a pumping action that can allow heated air to exit through these openings (167-171).

iii. Despite hypothetical considerations above, there are few human studies that have examined thermoregulation and manipulated these clothing characteristics. Studies examining cotton, wool/cotton blend, and polyester fabrics have generally shown no differences in rectal, skin or total body temperatures at exercise intensities of 40 and 70%VO2max in still air. Scaled subjective ratings of factors like clothing comfort, thermal sensation, sweating sensation, clothing humidity, skin wettedness and temperature sensation have not differed (172, 173). However, at a head wind velocity of 1.5m/sec and exercise intensity of 40%VO2max, rectal temperature was lower for the wool/cotton blend and skin temperature was highest for the polyester material. Moisture regain was the least with the polyester material and sweating was highest withy that material (172). A study of fabric color generally showed that black fabrics resulted in higher esophageal temperature, higher skin temperatures, and higher heart rates during light work on a cycle ergometer (171). Nylon-spandex fabrics coated with polyurethane

or additional fabric layers resulted in higher skin temperatures, less evaporation, increased perceived exertion and less subjective comfort compared to nylon-spandex alone (174).

iv. Studies (172, 173) suggest that clothing fabric may be less important for thermoregulation and subjective sensations than other clothing characteristics. When operating in hot environments, clothing that most easily allows evaporation and has lower insulating quality would be most desirable. Designing summer uniforms that are thinner, loosely woven, breathable, and of a lighter color may be appropriate.

v. Table 103 contains companies that specialize in Band uniforms. We called a Band clothing company (Stanbury) and spoke to a representative. This company offers 4 fabric options 1) wool, weight 15.5-16.0 oz, 2) wool/dacron blend, 14.0-14.5 oz, 3) polyester blend, 14.0 oz, and, 4) polyester blend, 10.0-11.0 oz. Custom uniform design involves working with a Stanbury representative on digital design sketches. Two samples are produced from selected sketches; this process takes approximately 3 weeks. After final approval of a sample, it takes 180-210 days for delivery of uniforms. A rough estimate of the cost for a uniform is $400 including 1 jacket, 1 pair of trousers, and 1 hat. Additional pieces can be added at a greater expense.

Table 103. Companies that Specialize in Band Uniforms

Company	Website	Comments
Stanbury	www.stanbury.com	Custom uniforms
Fruehauf	www.fruhauf.com	Custom; good guidelines for uniforms
DeMoulin	www.demoulin.com/home.lasso	
Bandmans	www.bandmans.com	Custom uniforms
Ictus	Ictuslimited.com	Custom uniforms

(i) Change Chairs.

i. During the focus group interviews Soldiers in the string and concert groups noted that chairs were inadequate. We noted during the set-up for and performance of the Twilight Tattoo members of the blues unit were seated in folding metal chairs. We could find no studies that had specifically examined whether or not chairs could reduce musculoskeletal symptoms or injuries in musicians.

ii. It is possible to categorize chairs into 3 groups: folding chairs, stackable chairs and special function chairs. Differentiating chairs in this manner have important implication in terms of adjustability and portability. For example, special function chairs typically offer the greatest adjustability but will yield more burden for transport and manual handling. Folding chairs offer the least adjustability but are very compact and, therefore, easier to transport and handle. If

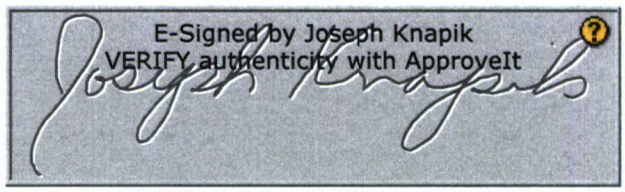
transport and manual handling burden are issues, it might be useful to consider purchase of a chair like the Samsonite Piviot Back Folding Chair. It appears to be very durable, seems to offer a fairly ample amount of padding and a swivel back. The design might also allow for a sizing option: cutting off legs to fit to smaller "stature" members and engraving the band member's name on the chair. Table 104 provides these chairs by category. None of these chairs have armrests.

iii. In addition to chairs, there is an angled cushion that might be of use to some Band members. This is called the Ergo Cush and can be examined at www.alimed.com/ProductDetail.asp?style=1177&fprd=Ergo+cush&oid1=233&oid2=237

Table 104. Chairs from various Companies Including Companies that Specialize in Band Chairs

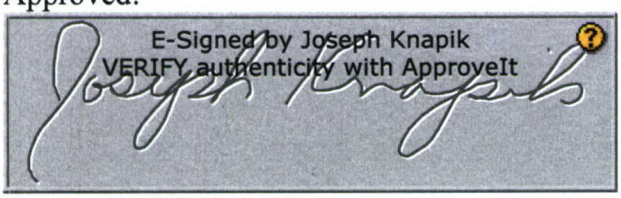
Type	Item	Height Adjustable	Lumbar Support	Seat back	Company
Folding	Pivot Back Folding Chair	No	None	Part	www.samsonite-furniture.com/samsonite/product.asp?productID=400
	Balt Folding Chair	No	None	Part	www.csnchairs.com/Balt-T-380-Folding-Chair-BL1224.html
	5000 Series Blow-Mold Folding Chair	No	None	Part	www.bizchair.com/500316-res.html
Stackable	Ergonomic Concert Chair	No	None	Part	www.concertdesign.com/allegro.html
	Essex Stacker Chair	No	None	Full	www.bizchair.com/res2170bk-reg.html
	Musicians Stackable Chair	No	None	Full	www.bizchair.com/cm1020-ifk.html
	Adjustable Height Chair	Yes	None	Part	www.bizchair.com/560-csc.html
Traditional	Music Posture Performing Stool	Yes	Fixed	Full	www.musicomfort.com/concert.html
	MusiComfort Standard Model	Yes	Fixed	Full	www.musicomfort.com/concert.html
	Sound Seat	Yes	None	None	www.soundseat.com/models.html

9. CONCLUSIONS. The injury visit rate for the US Army Band was lower than that of the entire Army or Army subsamples of comparable age. Despite this, the cumulative injury incidence (51%), incidence of duty-related injuries (37%), and prevalence of musculoskeletal symptoms (63%) was relatively high. A number of recommendations were made as a result of data collected from focus group interviews, questionnaire responses, observations on Band activities, and by matching acquired data to injury incidence and musculoskeletal symptoms. The recommendations were graded based on 1) the weight of the evidence that a problem existed, 2) the effectiveness of potential interventions to reduce the problem (judged from previous literature), and 3) the expense of the intervention. Implementing some or all of the suggested interventions is likely to reduce injuries and musculoskeletal symptoms in the US Army Band.



JOSEPH J. KNAPIK
Research Physiologist

Approved:



For BRUCE H. JONES
Program Manager, Injury Prevention

Appendix A

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Appendix B
EPICON Request Letter from Commander, US Army Band

DEPARTMENT OF THE ARMY
THE UNITED STATES ARMY BAND "PERSHING'S OWN"
400 McNAIR ROAD
FORT MYER, VIRGINIA 22211-1306

ANAB

9 January 2006

MEMORANDUM FOR Executive Office of the Surgeon General (DASG-ZXA/ Ms. Sil Finamore. 5109 Leesburg Pike. Room 672. Falls Church, VA 22041

SUBJECT: Request for MEDCOM Assistance

1. Request the US Army Medical Command (MEDCOM) evaluate personnel assigned to The United States Army Band (Pershing's Own) for occupational injuries and recommend prevention strategies to reduce physical impairments. The Army Band's high OPTEMPO in a high profile environment requires preservation of every Soldier's physical performing ability while they serve in a specialized assignment and MOS within the Acquired Skills Program.

2. Request assistance from the US Army Center for Health Promotion and Preventative Medicine (CHPPM) to study injury rates and project design in injury preventative measures. The personnel of the United States Army Band frequently perform in support of the President and many other dignitaries, and are assigned to the MOS 42S. Special Bandsperson, in stabilized duty for the duration of their Army careers. Recommendations and results of this study have the potential to greatly improve the quality of life of the Soldier/Musician. CHPPM findings stand to greatly enhance the overall mission readiness at TUSAB and for other Army bands.

3. The advice and guidance of CHPPM will increase the physical readiness of TUSAB Soldiers in direct support of the President, Vice President, Departments of State and Defense. Department of the Army and the Military District of Washington.

4. Specifically request medical guidance to determine proper foot. ankle and back care for prolonged standing. and physiology expertise in the prevention of repetitive motion injuries common to musicians.

5. Army Band staff has made initial contact with the Injury Control Program at the CHPPM. Dr. Joseph Knapik and Dr. Bruce Jones have concurred that this project is worthwhile.

6. POC for this request is MSG Greg Twombley, (703) 696-3643 ext 16. email: greg.twombley@us.army.mil

THOMAS ROTONDI, JR.
COL. AG
Commanding

Appendix C.
Questions for Focus Group Interviews

1. Interview Questions for Instrumentalists

(Introduce self and interview staff by first name and mention we are from the CHPPM which is involved in health promotion and preventive medicine)

We have been requested by your commander, COL Rotondi, to look into injuries that might be occurring in the Band and see if we can help reduce these injuries. We will ask you a series of questions that will help us get at injury risk factors and common pain symptoms or injuries that you or other members of the Band might experience. We are very interested in any ideas you have for reducing the risk of pain or injuries and we will ask you about these near the end of the interview.

RISK FACTORS FOR INJURIES (30 min)

a. We would like to start by asking you about factors that might put you at risk of injury. Can you think of tasks that you perform that might put you or other band members at risk of injury?

b. (As the conversation slows down) Some things that might put you at risk of injury may include things like too much practice, too many performances, inability to relax, performance anxiety and the like. Risk factors for injuries may also be things related to physical training, travel, things you do on post, things you do at home and the like.

(1) Do you think any of the things I just mentioned put you at risk of injury?

(2) Can you add any other things that might put you at risk of injury?

c. If you look at the questionnaire there are some questions we worked up based on our reading of the medical literature regarding factors that might put performing artists at risk of injury. Would you look at these questions and see if they are worded correctly so they can be understood by the other instrumentalists in the Band?

PAIN, SORENESS, DISCOMFORT, AND INJURIES (30 min)

We would like to find out about any pain, soreness, discomfort, or injuries you might have had that caused you problems.

a. I'll ask you about painful symptoms related to your musical instrument first. Since you have been in the Army Band, have you ever had to curtail practice or a performance because of pain, soreness, discomfort, weakness, numbness or tingling related to your musical instrument?

If answer yes - What was the cause of the injury?
If answer yes - Did it affect ability to perform?

b. Now I'll ask you about painful symptoms not related to your musical instrument. Since you have been in the Army Band, have you ever had pain, soreness, discomfort, weakness, numbness or tingling that was related to something other than your musical instrument?

If answer yes - What was the cause of the injury?
If answer yes - Did it affect ability to perform?

c. Now, I'll ask you specifically about injuries

(1) While you have been in the Army Band, have you ever been injured while practicing or performing?

If answer yes - What was the cause of the injury?
If answer yes - Did it affect ability to perform?

(2) While in the Army Band have you sustained injuries not related to practicing or performing? Do you know of cases where other members of the Band sustained an injury not related to practicing or performing?

If answer yes - What was the cause of the injury?
If answer yes - Did it affect daily activities?

d. If you look at the questionnaire, there are some questions relating to pain and injuries that we have worked up based on past projects we have done. Would you look at these questions and see if they are worded correctly so they can be understood by the other instrumentalists in the Band?

REDUCING INJURIES (30 min)

Do you have any ideas on how we can reduce pain, soreness, discomfort or injuries that you or other band members experience? (Facilitators list the tasks associated with injuries [from section 1] so the interviewees can relate back to them)

HEARING (20 min)

a. Are you concerned about hearing loss based on what you do in the Army Band?

b. On the questionnaire are some questions relating to hearing that we have worked up based on past projects we have done. Would you look at these questions and see if they are worded correctly so they can be understood by the other instrumentalists in the Band?

END OF INTERVIEW

(Thank each person for their participation and ideas. Let them know: 1) we will construct a new questionnaire based on their input, 2) a briefing is scheduled for COL Rotondi in August and 3) a final report will be completed by the end of the year.

2. Interview Questions for Vocalists

(Introduce self and interview staff by first name and mention we are from the CHPPM which is involved in health promotion and preventive medicine)

We have been requested by your commander, COL Rotondi, to look into injuries that might be occurring in the Band and see if we can help reduce these injuries. We will ask you a series of questions that will help us get at injury risk factors and common pain symptoms or injuries that you or other members of the Band might experience. We are very interested in any ideas you have for reducing the risk of pain or injuries and we will ask you about these near the end of the interview.

RISK FACTORS FOR INJURIES (30 min)

a. We would like to start by asking you about factors that might put you at risk of injury. Can you think of <u>tasks</u> that you perform that might put you or other band members at risk of injury?

b. (As the conversation slows down) Some things that might put you at risk of injury may include things like too much practice, too many performances, inability to relax, performance anxiety and the like. Risk factors for injuries may also be things related to physical training, travel, things you do on post, things you do at home and the like.

(1) Do you think any of the things I just mentioned put you at risk of injury?

(2) Can you add any other things that might put you at risk of injury?

c. If you look on the questionnaire, there are some questions we worked up based on our reading of the medical literature regarding factors that might put performing artists at risk of

injury. Would you look at these questions and see if they are worded correctly so they can be understood by the other singers/dancers in the Band?

PAIN, SORENESS, DISCOMFORT, AND INJURIES (30 min)

We would like to find out about any pain, soreness, discomfort, or injuries you might have had that caused you problems.

a. First, I'll ask you about painful symptoms related to your singing and dancing. Since you have been in the Army Band, have you ever had to curtail practice or a performance because of pain, soreness, discomfort, weakness, numbness or tingling related to your singing or dancing?

If answer yes - What was the cause of the injury?
If answer yes - Did it affect ability to perform?

b. Now I'll ask you about painful symptoms <u>not</u> related to singing or dancing. Since you have been in the Army Band, have you ever had pain, soreness, discomfort, weakness, numbness or tingling that was related to something <u>other than</u> your singing and dancing?

If answer yes - What was the cause of the injury?
If answer yes - Did it affect ability to perform?

c. Now, I'll ask you specifically about injuries

(1) While you have been in Army Band, have you ever been injured while singing or dancing?

If answer yes - What was the cause of the injury?
If answer yes - Did it affect ability to perform?

(2) While in the Army Band have you sustained injuries <u>not</u> related to singing or dancing?

If answer yes - What was the cause of the injury?
If answer yes - Did it affect daily activities?

d. On the questionnaire are some questions relate to pain and injuries and we have worked these questions up based on past projects we have done. Would you look at these questions and see if they are worded correctly so they can be understood by the other singers and dancers in the Band?

REDUCING INJURIES (30 min)

Do you have any ideas on how we can reduce pain, soreness, discomfort or injuries that you or other band members experience? (Facilitators list the tasks associated with injuries [from section 1] so the interviewees can relate back to them)

HEARING (20 min)

a. Are you concerned about hearing loss based on what you do in the Army Band?

b. On the questionnaire, Questions 21-29 are some relating to hearing that we have worked up based on past projects we have done. Would you look at these questions and see if they are worded correctly so they can be understood by the other singers/dancers in the Band?

END OF INTERVIEW

(Thank each person for their participation and ideas. Let them know: 1) we will construct a new questionnaire based on their input, 2) a briefing is scheduled for COL Rotondi in August and 3) a final report will be completed by the end of the year.

3. Interview Questions for Mixed Instrumentalists and Vocalists

(Introduce self and interview staff by first name and mention we are from the CHPPM which is involved in health promotion and preventive medicine)

We have been requested by your commander, COL Rotondi, to look into injuries that might be occurring in the Band and see if we can help reduce these injuries. We will ask you a series of questions that will help us get at injury risk factors and common pain symptoms or injuries that you or other members of the Band might experience. We are very interested in any ideas you have for reducing the risk of pain or injuries and we will ask you about these near the end of the interview.

RISK FACTORS FOR INJURIES (30 min)

a. We would like to start by asking you about factors that might put you at risk of injury. Can you think of <u>tasks</u> that you perform that might put you or other band members at risk of injury?

b. (As the conversation slows down) Some things that might put you at risk of injury may include things like too much practice, too many performances, inability to relax, performance

anxiety and the like. Risk factors for injuries may also be things related to physical training, travel, things you do on post, things you do at home and the like.

(1) Do you think any of the things I just mentioned put you at risk of injury?

(2) Can you add any other things that might put you at risk of injury?

c. If you look on the questionnaire are some questions we worked up based on our reading of the medical literature regarding factors might put performing artists at risk of injury. Would you look at these questions and see if they are worded correctly so they can be understood by the other instrumentalists and singers/dancers in the Band?

PAIN, SORENESS, DISCOMFORT, AND INJURIES (30 min)

We would like to find out about any pain, soreness, discomfort, or injuries you might have had that caused you problems.

a. First, I'll ask you about painful symptoms related to your playing, singing and dancing. Since you have been in the Army Band, have you ever had to curtail practice or a performance because of pain, soreness, discomfort, weakness, numbness or tingling related to your instrument or singing or dancing?

If answer yes - What was the cause of the injury?
If answer yes - Did it affect ability to perform?

b. Now I'll ask you about painful symptoms <u>not</u> related to singing or dancing. Since you have been in the Army Band, have you ever had pain, soreness, discomfort, weakness, numbness or tingling that was related to something <u>other than</u> your instrument, singing and dancing?

If answer yes - What was the cause of the injury?
If answer yes - Did it affect ability to perform?

c. Now, I'll ask you specifically about injuries

(1) While you have been in Army Band, have you ever been injured while playing, singing or dancing?

If answer yes - What was the cause of the injury?
If answer yes - Did it affect ability to perform?

(2) While in the Army Band have you sustained injuries <u>not</u> related to playing, singing or dancing?

If answer yes - What was the cause of the injury?
If answer yes - Did it affect daily activities?

d. On the questionnaire are some questions related to pain and injuries and we have worked these questions up based on past projects we have done. Would you look at these questions and see if they are worded correctly so they can be understood by the other singers and dancers in the Band?

REDUCING INJURIES (30 min)

Do you have any ideas on how we can reduce pain, soreness, discomfort or injuries that you or other band members experience? (Facilitators list the tasks associated with injuries [from section 1] so the interviewees can relate back to them)

HEARING (20 min)

a. Are you concerned about hearing loss based on what you do in the Army Band?

b. On the questionnaire are some questions relating to hearing that we have worked up based on past projects we have done. Would you look at these questions and see if they are worded correctly so they can be understood by the other instrumentalists and singers/dancers in the Band?

END OF INTERVIEW

(Thank each person for their participation and ideas. Let them know: 1) we will construct a new questionnaire based on their input, 2) a briefing is scheduled for COL Rotondi in August and 3) a final report will be completed by the end of the year.

4. Interview Questions for Support Personnel

(Introduce self and interview staff by first name and mention we are from the CHPPM which is involved in health promotion and preventive medicine)

We have been requested by your commander, COL Rotondi, to look into injuries that might be occurring in the Band and see if we can help reduce these injuries. We will ask you a series of questions that will help us get at injury risk factors and common pain symptoms or injuries that you or other members of the Band might experience. We are very interested in any ideas you have for reducing the risk of pain or injuries and we will ask you about these near the end of the interview.

RISK FACTORS FOR INJURIES (30 min)

a. We would like to start by asking you about factors that might put you at risk of injury. Can you think of tasks that you perform that might put you or other band members at risk of injury?

b. (As the conversation slows down) Some things that might put you at risk of injury may include things like too many Band set-ups, lifting heavy objects, long working hours, and the like. Risk factors for injuries may also be things related to physical training, travel, things you do on post, things you do at home and the like.

(1) Do you think any of the things I just mentioned put you at risk of injury?

(2) Can you add any other things that might put you at risk of injury?

c. If you look on the questionnaire there are some questions we worked up based on our reading of the medical literature regarding factors that might put you at risk of injury. Would you look at these questions and see if they are worded correctly so they can be understood by the other support members of the Band?

PAIN, SORENESS, DISCOMFORT, AND INJURIES (30 min)

We would like to find out about any pain, soreness, discomfort, or injuries you might have had that caused you problems.

a. I'll ask you about painful symptoms related to your work first. Since you have been in the Army Band, did you ever have a situation where you could not do a set-up because of pain, soreness, discomfort, weakness, numbness or tingling?

If answer yes - What was the cause of the injury?
If answer yes - Did it affect ability to perform?

b. Now I'll ask you about painful symptoms not related to your work. Since you have been in the Army Band, have you ever had pain, soreness, discomfort, weakness, numbness or tingling that was related to something other than setting up?

If answer yes - What was the cause of the injury?
If answer yes - Did it affect ability to perform?

c. Now, I'll ask you specifically about injuries

(1) While you have been in the Army Band, have you ever been injured specifically while doing a set-up?

If answer yes - What was the cause of the injury?
If answer yes - Did it affect ability to perform?

(2) While in the Army Band have you sustained injuries not related to a set-up? Do you know of cases where other members of the Band sustained an injury not related to a set-up?
If answer yes - What was the cause of the injury?
If answer yes - Did it affect daily activities?

c. On the questionnaire are some questions relating to pain and injuries we have worked up based on past projects we have done. Would you look at these questions and see if they are worded correctly so they can be understood by the other support members of the Band?

REDUCING INJURIES (30 min)

Do you have any ideas on how we can reduce pain, soreness, discomfort or injuries that you or other band members experience? (Facilitators list the tasks associated with injuries [from section 1] so the interviewees can relate back to them)

HEARING (20 min)

a. Are you concerned about hearing loss based on what you do in the Army Band?

b. On the questionnaire are some questions relating to hearing that we have worked up based on past projects we have done. Would you look at these questions and see if they are worded correctly so they can be understood by the other support members of the Band?

END OF INTERVIEW

(Thank each person for their participation and ideas. Let them know: 1) we will construct a new questionnaire based on their input, 2) a briefing is scheduled for COL Rotondi in August and 3) a final report will be completed by the end of the year.)

APPENDIX D
Questionnaires

1. Questionnaire for Army Band (Instrumentalists)

In this questionnaire you will be asked about playing your instrument, your health, and your lifestyle. Please answer each question as accurately as possible.

Name _____

PLAYING YOUR INSTRUMENT AND PERFORMING

1. TIME WITH YOUR INSTRUMENT. Your primary musical instrument is the one you use for most US Army Band functions. How many years have you been playing your primary musical instrument?

___ Less than 6 years
___ 6-8 years
___ 9-11 years
___ 12-14 years
___ 15-17 years
___ 18-20 years
___ 21-23 years
___ 24-26 years
___ 27-29 years
___ 30-32 years
___ 33-35 years
___ 36-38 years
___ 39-41years
___ 42-44 years
___ 45-47 years
___ More than 47 years

2. PLAYING FREQUENCY. How many days/wk did you rehearse, practice and/or perform with your primary musical instrument in the last year, on average (including US Army Band activities and elsewhere)?

___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

3. PLAYING DURATION. On days when you rehearsed, practiced and/or performed with your primary musical instrument in the last year, how long did you play, on average (including US Army Band activities and elsewhere)?

___ None
___ Less than 30 min
___ 30-60 min
___ 61-120 min (1-2 hours)
___ 121-180 min (2-3 hours)
___ 181-240 min (3-4 hours)
___ 241-300 min (4-5 hours)
___ 301-360 min (5-6 hours)
___ 361-420 min (6-7 hours)
___ More than 420 min (more than 7 hours)

4. OTHER MUSICAL INSTRUMENT. Do you have other musical instruments you play?

___ No. (If no, go to Question 7)
___ Yes. If Yes, what are the other instruments? _____

5. PLAYING FREQUENCY. How many days/wk did you rehearse, practice, and/or perform with your other musical instrument in the last year, on average (including US Army Band activities and elsewhere)?

___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

6. PLAYING DURATION. On days when you rehearsed, practiced, and/or performed with your other musical instruments in the last year, how long did you play, on average (including US Army Band activities and elsewhere)?

___ None
___ Less than 30 min
___ 30-60 min
___ 61-120 min (1-2 hours)
___ 121-180 min (2-3 hours)
___ 181-240 min (3-4 hours)
___ 241-300 min (4-5 hours)
___ 301-360 min (5-6 hours)
___ More than 360 min (more than 6 hours)

7. STANDING.

a. How much time do you spend standing when you rehearse, practice, or perform, on average?

___ None
___ Less than 30 min
___ 30-60 min
___ 61-90 min (1-1.5 hours)
___ 91-120 min (1.5-2 hours)
___ 121-150 min (2-2.5 hours)
___ 151-180 min (2.5-3 hours)
___ 181-240 min (3-4 hours)
___ More than 240 min (more than 4 hours)

b. What percent of the time do you spend standing when you rehearse, practice, or perform, on average?

___ None
___ 1-10%
___ 11-20%
___ 21-30%
___ 31-40%
___ 41-50%
___ 51-60%
___ 61-70%
___ 71-80%
___ 81-90%
___ 91-100%

8. MARCHING.

a. How much time do you spend marching when you rehearse, practice or perform, on average?

___ None
___ Less than 30 min
___ 30-60 min
___ 61-90 min (1-1.5 hours)
___ 91-120 min (1.5-2 hours)
___ 121-150 min (2-2.5 hours)
___ 151-180 min (2.5-3 hours)
___ 181-240 min (3-4 hours)
___ More than 240 min (more than 4 hours)

b. What percent of the time do you spend marching when you rehearse, practice, or perform, on average?

___ None
___ 1-10%
___ 11-20%
___ 21-30%
___ 31-40%
___ 41-50%
___ 51-60%
___ 61-70%
___ 71-80%
___ 81-90%
___ 91-100%

9. WELLNESS INSTRUCTION

a. Wellness involves care of the body through diet, exercise, and rest. While in music school, did you receive instruction on wellness?

___ No
___ Yes

b. While in the Army, did you receive instruction on wellness?

___ No
___ Yes

10. RELAXATION WHILE PLAYING.

a. Do you usually feel relaxed when you play?

___ No
___ Yes

b. When playing, do you deliberately work on relaxing your muscles?

___ No
___ Yes

11. SHOES. Do you have any problems with the shoes you wear for performances?

___ No
___ Yes. If yes, what are the problems?_____
_____

12. UNIFORMS. Do you have any problems with the uniforms you wear for performances?

___ No
___ Yes. If yes, what are the problems?_____
_____

EXERCISE AND SPORTS

13. AEROBIC EXERCISE

a. How many days per week did you perform aerobic exercise (running, cycling, swimming, etc.) in the last year, on average?

___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

b. On days when you performed aerobic exercise (running, cycling, swimming, etc.) in the last year, how long did you exercise, on average?

___ None
___ Less than 15 min
___ 15-30 min
___ 31-45 min
___ 46-60 min
___ More than 60 min

14. STRENGTH TRAINING

a. How many days per week did you exercise to improve your strength (free weights, universal, nautilus, push-ups, sit-ups, etc.) in the last year, on average?

___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

b. On days when you exercised to improve your strength (free weights, universal, nautilus, push-ups, sit-ups, etc.) in the last year, how long did you exercise, on average?

___ None
___ Less than 15 min
___ 15-30 min
___ 31-45 min
___ 46-60 min
___ More than 60 min

15. SPORTS ACTIVITY

a. How many days per week did you participate in sports activities in the last year, on average?

___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

b. On days that you participated in sports activities in the last year, how long did you participate, on average?

___ None
___ Less than 15 min
___ 15-30 min
___ 31-45 min
___ 46-60 min
___ 61-90 min (1-1.5 hours)
___ 91-120 min (1.5 to 2 hours
___ 121-150 min (2-2.5 hours)
___ More than 150 min (more than 2.5 hours)

16. OTHER PHYSICAL ACTIVITY

a. How many days per week did you perform other physical activity (like gardening, home repair, hunting, fishing, wood cutting, etc.) in the last year, on average?

___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

b. On days that you performed other physical activity (like gardening, home repair, hunting, fishing, wood cutting, etc.) in the last year, how long did you participate, on average?

___ None
___ Less than 15 min
___ 15-30 min
___ 31-45 min
___ 46-60 min
___ 61-120 min (1-2 hours)
___ 121-180 min (2-3 hours)
___ 181-240 min (3-4 hours)
___ 241-300 min (4-5 hours)
___ More than 300 min (more than 5 hours)

17. OVERALL PHYSICAL ACTIVITY. Overall, how would you rate yourself as to the amount of physical activity you perform, compared to others of your age and sex?

___ Much more active
___ Somewhat more active
___ About the same
___ Somewhat less active
___ Much less active

TOBACCO USE

18. SMOKING: Which statement best describes your smoking habits in the last year?

___ I have never been a smoker
___ I smoked but quit ----------→
___ I smoke 10 or fewer cigarettes per day
___ I smoke 11 to 20 cigarettes per day
___ I smoke more than 20 cigarettes per day
___ I quit less than 6 months ago
___ I quit 6 months to 1 year ago
___ I quit more than a year ago

19. SMOKELESS TOBACCO: What statement best describes your use of smokeless tobacco (chewing, dipping or pinching) in the last year?

___ I have never used smokeless tobacco
___ I used smokeless tobacco but quit ----------→
___ I use smokeless tobacco one time per day or less
___ I use smokeless tobacco 2-4 times per day
___ I use smokeless tobacco 5-10 times per day
___ I use smokeless tobacco more than 10 times per day
___ I quit less than 6 months ago
___ I quit 6 months to 1 year ago
___ I quit more than a year ago

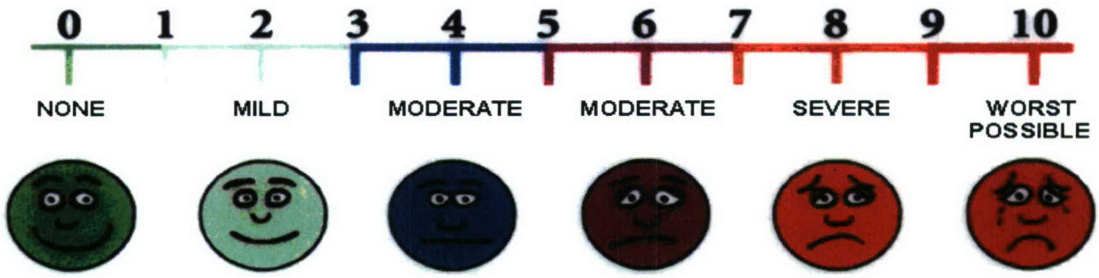
MEDICAL PROBLEMS AND MEDICAL CARE

20. PAIN WHILE PLAYING. Do you currently have pain, soreness, discomfort, weakness, numbness, or tingling while rehearsing, practicing, and/or performing?

___ No (If no, go to Question 24)
___ Yes.

a. If yes, in what part of your body do you experience the most pain, soreness, discomfort, weakness, numbness, or tingling while practicing or performing? _____

b. If yes, grade the pain, soreness, discomfort, weakness, numbness, or tingling for this part of your body (circle a number).



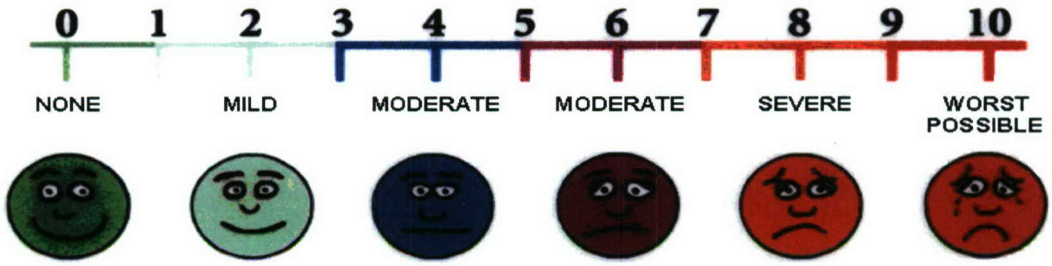
21. PAIN WHILE PLAYING. Is there a second part of your body where you currently have pain, soreness, discomfort, weakness, numbness, or tingling while rehearsing, practicing, or performing?

___ No (If no, go to Question 24)

___ Yes

a. If yes what is this second part of your body where you experience pain, soreness, discomfort, weakness, numbness, or tingling? _____

b. If yes, grade the pain, soreness, discomfort, weakness, numbness, or tingling for this part of your body (circle a number).



22. PAIN WHILE PLAYING. Are there other parts of your body where you currently experience pain, soreness, discomfort, weakness, numbness, or tingling when rehearsing, practicing, or performing?

___ No

___ Yes

23. CHANGES DUE TO PAIN. Does pain, soreness, discomfort, weakness, numbness, or tingling ever cause you to modify the way you hold or play your instrument?

___ Unsure

___ No

___ Yes. If yes, how do you modify your holding or playing of the instrument?_____

_____

24. FOOT PROBLEMS: Do you have foot pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?

___ No

___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

25. KNEE PROBLEMS: Do you have knee pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

26. BACK PROBLEMS: Do you have back pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

27. SHOULDER PROBLEMS: Do you have shoulder pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

28. NECK PROBLEMS: Do you have neck pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

29. WRIST PROBLEMS: Do you have wrist pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

30. HAND/FINGER PROBLEMS: Do you have hand or finger pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

31. DENTAL PROBLEMS: Do you have problems with your teeth, jaws or embouchure (lips and tongue) that cause you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

32. VOCAL PROBLEMS: Do you have vocal pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

33. INJURIES YOU MIGHT HAVE HAD. Injuries include acute injuries (those that are sudden and unexpected) as well as overuse injuries (those involving pain that develops over time and might be chronic or recurrent). Did you have an injury during Calendar Year 2005 related to playing your musical instrument (whether or not you sought medical care for these injuries)?

___ No. (If no, go to Question 35)
___ Yes.

34. INJURIES: If you had an injury in Calendar Year 2005 related to playing your musical instrument, complete the information below. If you had more than one injury to a particular body part, list only the most serious one.

INJURED		BODY PART	DAYS OF LIMITED	TYPE OF INJURY	CAUSE OF INJURY
No	Yes		DUTY (profile)(if any)		
___	___	Vocal Cords	_____	_____	_____
___	___	Teeth/Jaws	_____	_____	_____
___	___	Head	_____	_____	_____
___	___	Neck	_____	_____	_____
___	___	Shoulders	_____	_____	_____
___	___	Upper Arm	_____	_____	_____
___	___	Lower Arm	_____	_____	_____
___	___	Wrist	_____	_____	_____
___	___	Hand	_____	_____	_____
___	___	Fingers	_____	_____	_____
___	___	Chest	_____	_____	_____
___	___	Upper Back	_____	_____	_____
___	___	Lower Back	_____	_____	_____
___	___	Abdomen	_____	_____	_____
___	___	Hip	_____	_____	_____
___	___	Thigh	_____	_____	_____
___	___	Knee	_____	_____	_____
___	___	Calf/Shin	_____	_____	_____
___	___	Ankle	_____	_____	_____
___	___	Foot	_____	_____	_____
___	___	Toes	_____	_____	_____

35. HEALTH CARE FACILITY. Where do you usually get your medical care?

___ Rader Health Clinic (Ft Myer)
___ Walter Reed Army Medical Center
___ DeWitt Army Community Hospital (Ft Belvoir)
___ Other military medical facility. Write name of facility _____
___ Civilian medical facility. Write name of facility _____

36. SATISFACTION WITH MEDICAL CARE. How satisfied are you with the quality of the medical care you have received at the medical facility?

___ Completely satisfied
___ Reasonably satisfied
___ Borderline
___ Moderately unsatisfied
___ Extremely unsatisfied

37. CHANGES YOU WOULD RECOMMEND. To reduce the possibility of injury, what two aspects of your job would you change (if any)?

1. _____

2. _____

HEARING

38. To what degree are you concerned about hearing loss from what you do in the Army Band?
___ Extremely concerned
___ Very concerned
___ Somewhat concerned
___ A little unconcerned
___ Not concerned

39. Do your ears ever ring and/or do you ever have a sensation of fullness in your ears after a practice session, rehearsal or performance?
___No
___Yes

40. Which statement do you think is true? Check all that apply.
____ Distorted music is more hazardous to your hearing than well played music at the same loudness level.
____ Listening to music through stereo earphones is potentially less hazardous to your hearing because more ambient noise and sound is blocked.
____ Hearing loss from loud noise or loud music can become permanent.
____ New developments in hearing aids can completely restore a hearing loss from hazardous noise back to normal hearing.

41. Do you take more than one aspirin a day on a fairly regular basis?
___No
___Yes

42. Which statement do you agree with the most? Check one.
____ We are going to lose our hearing in old age anyway so why all the fuss about hearing protection?
____ As a musician, I value my hearing as my most precious learning and social sense.
____ As a musician, I have to accept a certain amount of hearing loss as unavoidable.

43. Do you use hearing protection during practice sessions?
___Never
___Sometimes
___Always

44. Do you use hearing protection during rehearsals?
___Never
___Sometimes
___Always

45. Do you use hearing protection during performances?
___Never
___Sometimes
___Always

46. What problems do you have with hearing protectors for singers? Check all that apply.
____ Interferes with my ability to monitor my performance
____ Interferes with my ability to monitor others' performances
____ Uncomfortable
____ Distorts the sound of my voice
____ Hearing protection is not available for band members
____ They don't work
____ I have no problems with my hearing protectors

47. Would you use a hearing protector that not only protected your hearing, but also enhanced your ability to hear others and monitor your performance?
___No
___Yes

48. Do you shoot skeet or frequent the rifle or pistol range as a hobby?
___No
___Yes

ADDITIONAL COMMENTS

49. Provide any additional comments or thoughts you might have._____

_____

_____

_____

_____

_____

2. Questionnaire for Army Band (Vocalists)

In this questionnaire you will be asked about your vocal practice, your dancing, your health, and your lifestyle. Please answer each question as accurately as possible.

Name _____

VOCAL/DANCE REHEARSAL, PRACTICE, AND PERFORMANCE

1. DANCING. In addition to singing in the US Army Band, do you also dance as part of your Band activities?
___ No
___ Yes

2. PRACTICE FREQUENCY. How many days/wk did you sing and/or dance in the last year, on average (include practices, rehearsals, and performances in the Band and elsewhere).

___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

3. PRACTICE DURATION. On days when you sang and/or danced in the last year, how long did you do this, on average (include practices, rehearsals, and performances in the Band and elsewhere).

___ None
___ Less than 30 min
___ 30-60 min
___ 61-120 min (1-2 hours)
___ 121-180 min (2-3 hours)
___ 181-240 min (3-4 hours)
___ 241-300 min (4-5 hours)
___ 301-360 min (5-6 hours)
___ 361-420 min (6-7 hours)
___ More than 420 min (more than 7 hours)

4. STANDING.

a. How much time do you spend standing when you rehearse, practice, or perform, on average?

___ None
___ Less than 30 min
___ 30-60 min
___ 61-90 min (1-1.5 hours)
___ 91-120 min (1.5-2 hours)
___ 121-150 min (2-2.5 hours)
___ 151-180 min (2.5-3 hours)
___ 181-240 min (3-4 hours)
___ More than 240 min (more than 4 hours)

b. What percent of the time do you spend standing when you rehearse, practice, or perform, on average?

___ None
___ 1-10%
___ 11-20%
___ 21-30%
___ 31-40%
___ 41-50%
___ 51-60%
___ 61-70%
___ 71-80%
___ 81-90%
___ 91-100%

5. WELLNESS INSTRUCTION

a. Wellness involves care of the body through diet, exercise, and rest. While in music school, did you receive instruction on wellness?

___ No
___ Yes

b. While in the Army, did you receive instruction on wellness?

___ No
___ Yes

6. SHOES. Do you have any problems with the shoes you wear for performances?

___ No
___ Yes. If yes, what are the problems?

_____

7. UNIFORMS. Do you have any problems with the uniforms you wear for performances?

___ No
___ Yes. If yes, what are the problems?_____

_____

EXERCISE AND SPORTS

8. AEROBIC EXERCISE

a. How many days per week did you perform aerobic exercise (running, cycling, swimming, etc.) in the last year, on average?

___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

b. On days when you performed aerobic exercise (running, cycling, swimming, etc.) in the last year, how long did you exercise, on average?

___ None
___ Less than 15 min
___ 15-30 min
___ 31-45 min
___ 46-60 min
___ More than 60 min

9. STRENGTH TRAINING

a. How many days per week did you exercise to improve your strength (free weights, universal, nautilus, push-ups, sit-ups, etc.) in the last year, on average?

___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

b. On days when you exercised to improve your strength (free weights, universal, nautilus, push-ups, sit-ups, etc.) in the last year, how long did you exercise, on average?

___ None
___ Less than 15 min
___ 15-30 min
___ 31-45 min
___ 46-60 min
___ More than 60 min

10. SPORTS ACTIVITY

a. How many days per week did you participate in sports activities in the last year, on average?

___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

b. On days that you participated in sports activities in the last year, how long did you participate, on average?

___ None
___ Less than 15 min
___ 15-30 min
___ 31-45 min
___ 46-60 min
___ 61-90 min (1-1.5 hours)
___ 91-120 min (1.5 to 2 hours
___ 121-150 min (2-2.5 hours)
___ More than 150 min (more than 2.5 hours)

11. OTHER PHYSICAL ACTIVITY

a. How many days per week did you perform other physical activity (like gardening, home repair, hunting, fishing, wood cutting, etc.) in the last year, on average?

___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

b. On days that you performed other physical activity (like gardening, home repair, hunting, fishing, wood cutting, etc.) in the last year, how long did you participate, on average?

___ None
___ Less than 15 min
___ 15-30 min
___ 31-45 min
___ 46-60 min
___ 61-120 min (1-2 hours)
___ 121-180 min (2-3 hours)
___ 181-240 min (3-4 hours)
___ 241-300 min (4-5 hours)
___ More than 300 min (more than 5 hours)

12. OVERALL PHYSICAL ACTIVITY. Overall, how would you rate yourself as to the amount of physical activity you perform, compared to others of your age and sex?

___ Much more active
___ Somewhat more active
___ About the same
___ Somewhat less active
___ Much less active

TOBACCO USE

13. SMOKING: Which statement best describes your smoking habits in the last year?

___ I have never been a smoker
___ I smoked but quit ----------→ ___ I quit less than 6 months ago
___ I smoke 10 or fewer cigarettes per day ___ I quit 6 months to 1 year ago
___ I smoke 11 to 20 cigarettes per day ___ I quit more than a year ago
___ I smoke more than 20 cigarettes per day

14. SMOKELESS TOBACCO: What statement best describes your use of smokeless tobacco (chewing, dipping or pinching) in the last year?

___ I have never used smokeless tobacco
___ I used smokeless tobacco but quit ----------→ ___ I quit less than 6 months ago
___ I use smokeless tobacco one time per day or less ___ I quit 6 months to 1 year ago
___ I use smokeless tobacco 2-4 times per day ___ I quit more than a year ago
___ I use smokeless tobacco 5-10 times per day
___ I use smokeless tobacco more than 10 times per day

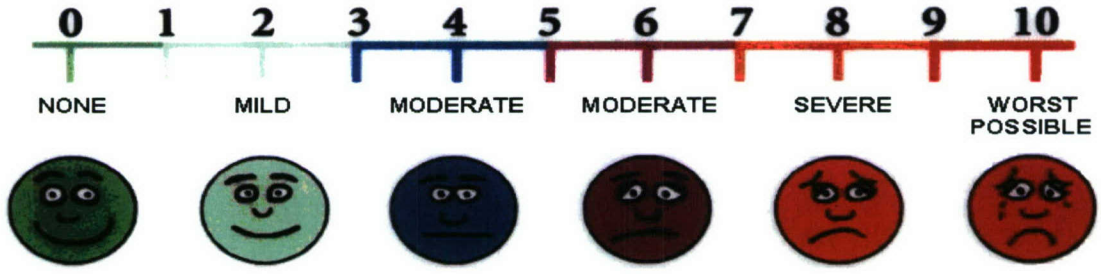
MEDICAL PROBLEMS AND MEDICAL CARE

15. PAIN WHILE SINGING/DANCING. Do you currently have pain, soreness, discomfort, weakness, numbness, or tingling while rehearsing, practicing, and/or performing?

___ No (If no, go to Question 19)
___ Yes.

a. If yes, in what part of your body do you experience the most pain, soreness, discomfort, weakness, numbness, or tingling while rehearsing, practicing or performing? _____

b. If yes, grade the pain, soreness, discomfort, weakness, numbness, or tingling for this part of your body (circle a number).

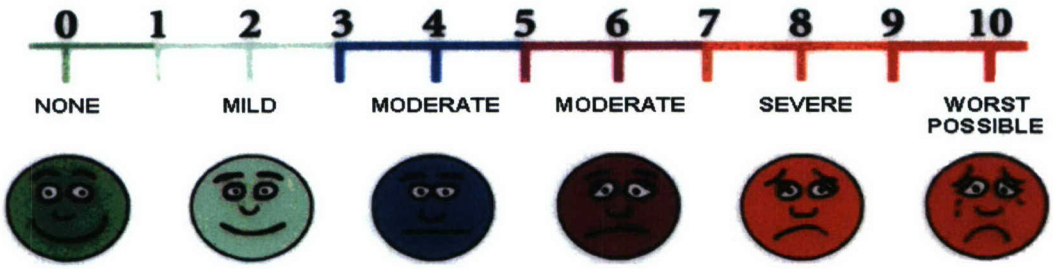


16. PAIN WHILE SINGING OR DANCING. Is there a second part of your body where you currently experience pain, soreness, discomfort, weakness, numbness, or tingling while rehearsing, practicing, or performing?

___ No (If no, go to Question 19)
___ Yes

a. If yes what is this second part of your body where you experience pain, soreness, discomfort, weakness, numbness, or tingling? _____

b. If yes, grade the pain, soreness, discomfort, weakness, numbness, or tingling for this part of your body (circle a number).



17. PAIN WHILE SINGING OR DANCING. Are there other parts of your body where you currently experience pain, soreness, discomfort, weakness, numbness, or tingling when rehearsing, practicing, or performing?
___ No
___ Yes

18. CHANGES DUE TO PAIN. Does pain, soreness, discomfort, weakness, numbness, or tingling ever cause you to modify the way you sing or dance?
___ Unsure
___ No
___ Yes. If yes, how do you modify your singing or dancing? _____
_____

19. FOOT PROBLEMS: Do you have foot pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

20. KNEE PROBLEMS: Do you have knee pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

21. BACK PROBLEMS: Do you have back pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

22. SHOULDER PROBLEMS: Do you have shoulder pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

23. NECK PROBLEMS: Do you have neck pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

24. WRIST PROBLEMS: Do you have wrist pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

25. HAND/FINGER PROBLEMS: Do you have hand or finger pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

26. DENTAL PROBLEMS: Do you have problems with your teeth, jaws or embouchure (lips and tongue) that cause you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

27. VOCAL PROBLEMS: Do you have vocal pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

28. INJURIES YOU MIGHT HAVE HAD. Injuries include acute injuries (those that are sudden and unexpected) as well as overuse injuries (those involving pain that develops over time and might be chronic or recurrent). Did you have an injury during Calendar Year 2005 related to singing or dancing (whether or not you sought medical care for these injuries)?
___ No. (If no, go to Question 30)
___ Yes.

29. INJURIES: If you had an injury in Calendar Year 2005 related to singing or dancing, complete the information below. If you had more than one injury to a particular body part, list only the most serious one.

INJURED		BODY PART	DAYS OF LIMITED	TYPE OF INJURY	CAUSE OF INJURY
No	Yes		DUTY (profile)(if any)		
___	___	Vocal Cords	_____	_____	_____
___	___	Teeth/Jaws	_____	_____	_____
___	___	Head	_____	_____	_____
___	___	Neck	_____	_____	_____
___	___	Shoulders	_____	_____	_____
___	___	Upper Arm	_____	_____	_____

___	___	Lower Arm	_____	_____	_____
___	___	Wrist	_____	_____	_____
___	___	Hand	_____	_____	_____
___	___	Fingers	_____	_____	_____
___	___	Chest	_____	_____	_____
___	___	Upper Back	_____	_____	_____
___	___	Lower Back	_____	_____	_____
___	___	Abdomen	_____	_____	_____
___	___	Hip	_____	_____	_____
___	___	Thigh	_____	_____	_____
___	___	Knee	_____	_____	_____
___	___	Calf/Shin	_____	_____	_____
___	___	Ankle	_____	_____	_____
___	___	Foot	_____	_____	_____
___	___	Toes	_____	_____	_____

30. HEALTH CARE FACILITY. Where do you usually get your medical care?
___ Rader Health Clinic (Ft Myer)
___ Walter Reed Army Medical Center
___ DeWitt Army Community Hospital (Ft Belvoir)
___ Other military medical facility. Write name of facility _____
___ Civilian medical facility. Write name of facility _____

31. SATISFACTION WITH MEDICAL CARE. How satisfied are you with the quality of the medical care you have received at the medical facility?
___ Completely satisfied
___ Reasonably satisfied
___ Borderline
___ Moderately unsatisfied
___ Extremely unsatisfied

32. CHANGES YOU WOULD RECOMMEND. To reduce the possibility of injury, what two aspects of your job would you change (if any)?

1._____

2._____

HEARING

33. To what degree are you concerned about hearing loss from what you do in the Army Band?
___ Extremely concerned
___ Very concerned
___ Somewhat concerned
___ A little unconcerned
___ Not concerned

34. Do your ears ever ring and/or do you ever have a sensation of fullness in your ears after a practice session, rehearsal or performance?
___No
___Yes

35. Which statement do you think is true? Check all that apply.
____ Distorted music is more hazardous to your hearing than well played music at the same loudness level.
____ Listening to music through stereo earphones is potentially less hazardous to your hearing because more ambient noise and sound is blocked.
____ Hearing loss from loud noise or loud music can become permanent.
____ New developments in hearing aids can completely restore a hearing loss from hazardous noise back to normal hearing.

36. Do you take more than one aspirin a day on a fairly regular basis?
___No
___Yes

37. Which statement do you agree with the most? Check one.
____ We are going to lose our hearing in old age anyway so why all the fuss about hearing protection?
____ As a singer I value my hearing as my most precious learning and social sense.
____ As a singer, I have to accept a certain amount of hearing loss as unavoidable.

38. Do you use hearing protection during practice sessions?
___Never
___Sometimes
___Always

39. Do you use hearing protection during rehearsals?
___Never
___Sometimes
___Always

40. Do you use hearing protection during performances?
___Never
___Sometimes
___Always

41. What problems do you have with hearing protectors for singers? Check all that apply.
____ Interferes with my ability to monitor my performance
____ Interferes with my ability to monitor others' performances
____ Uncomfortable
____ Distorts the sound of my voice
____ Hearing protection is not available for band members
____ They don't work
____ I have no problems with my hearing protectors

42. Would you use a hearing protector that not only protected your hearing, but also enhanced your ability to hear others and monitor your performance?
___No
___Yes

43. Do you shoot skeet or frequent the rifle or pistol range as a hobby?
___No
___Yes

44. What is the value of having your hearing tested annually? Check one.
___ No value.
___ Negative value. Band leaders may learn that I have a hearing loss and label me as hearing impaired and incapable of performing well
___ Positive value. Small changes in hearing sensitivity can be detected before a hearing loss becomes a problem.

ADDITIONAL COMMENTS

45. Provide any additional comments or thoughts you might have. _____

_____

_____

_____

_____

3. Questionnaire for Army Band (Support Group)

In this questionnaire you will be asked about your health, your work, and your lifestyle. Please answer each question as accurately as possible.

Name _____

MISSION SET-UP AND TEAR DOWN

1. MISSION FREQUENCY. In the last year, how many days/wk were you involved in mission set up and/or tear down for the Band, on average (including rehearsals, practices, and performances).

___ Not Applicable
___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

2. MISSION DURATION. On days you were involved in mission set-up and/or tear down for the Army Band in the last year, how long did these take, on average (including rehearsals, practices, and performances).

___ Not Applicable
___ None
___ Less than 30 min
___ 30-60 min
___ 61-120 min (1-2 hours)
___ 121-180 min (2-3 hours)
___ 181-240 min (3-4 hours)
___ 241-300 min (4-5 hours)
___ 301-360 min (5-6 hours)
___ 361-420 min (6-7 hours)
___ 421-480 min (7-8 hours
___ 481-540 min (8-9 hours)
___ 541-600 min (9-10 hours)
___ 601-660 min (10-11 hours)
___ More than 660 min (more than 11 hours)

3. SHOES. Do you have any problems with the shoes you wear for mission set-up and tear down?

___ Not Applicable
___ No
___ Yes. If yes, what are the problems? _____
_____

4. UNIFORMS. Do you have any problems with the uniforms you wear for mission set-up and tear down?

___ Not Applicable
___ No
___ Yes. If yes, what are the problems? _____
_____

EXERCISE AND SPORTS

5. AEROBIC EXERCISE

a. How many days per week did you perform aerobic exercise (running, cycling, swimming, etc.) in the last year, on average?

___ None
___ Less than 1 day/wk
___ 4 days/wk
___ 5 days/wk

___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 6 days/wk
___ 7 days/wk

b. On days when you performed aerobic exercise (running, cycling, swimming, etc.) in the last year, how long did you exercise, on average?

___ None
___ Less than 15 min
___ 15-30 min
___ 31-45 min
___ 46-60 min
___ More than 60 min

6. STRENGTH TRAINING

a. How many days per week did you exercise to improve your strength (free weights, universal, nautilus, push-ups, sit-ups, etc.) in the last year, on average?

___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

b. On days when you exercised to improve your strength (free weights, universal, nautilus, push-ups, sit-ups, etc.) in the last year, how long did you exercise, on average?

___ None
___ Less than 15 min
___ 15-30 min
___ 31-45 min
___ 46-60 min
___ More than 60 min

7. SPORTS ACTIVITY

a. How many days per week did you participate in sports activities in the last year, on average?

___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

b. On days that you participated in sports activities in the last year, how long did you participate, on average?

___ None
___ Less than 15 min
___ 15-30 min
___ 31-45 min
___ 46-60 min
___ 61-90 min (1-1.5 hours)
___ 91-120 min (1.5 to 2 hours
___ 121-150 min (2-2.5 hours)
___ More than 150 min (more than 2.5 hours)

8. OTHER PHYSICAL ACTIVITY

a. How many days per week did you perform other physical activity (like gardening, home repair, hunting, fishing, wood cutting, etc.) in the last year, on average?

___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

b. On days that you performed other physical activity (like gardening, home repair, hunting, fishing, wood cutting, etc.) in the last year, how long did you participate, on average?

___ None
___ Less than 15 min
___ 15-30 min
___ 31-45 min
___ 46-60 min
___ 61-120 min (1-2 hours)
___ 121-180 min (2-3 hours)
___ 181-240 min (3-4 hours)
___ 241-300 min (4-5 hours)
___ More than 300 min (more than 5 hours)

9. OVERALL PHYSICAL ACTIVITY. Overall, how would you rate yourself as to the amount of physical activity you perform, compared to others of your age and sex?

___ Much more active
___ Somewhat more active
___ About the same
___ Somewhat less active
___ Much less active

TOBACCO USE

10. SMOKING: Which statement best describes your smoking habits in the last year?

___ I have never been a smoker
___ I smoked but quit ----------→
___ I smoke 10 or fewer cigarettes per day
___ I smoke 11 to 20 cigarettes per day
___ I smoke more than 20 cigarettes per day
___ I quit less than 6 months ago
___ I quit 6 months to 1 year ago
___ I quit more than a year ago

11. SMOKELESS TOBACCO: What statement best describes your use of smokeless tobacco (chewing, dipping or pinching) in the last year?

___ I have never used smokeless tobacco
___ I used smokeless tobacco but quit ----------→
___ I use smokeless tobacco one time per day or less
___ I use smokeless tobacco 2-4 times per day
___ I use smokeless tobacco 5-10 times per day
___ I use smokeless tobacco more than 10 times per day
___ I quit less than 6 months ago
___ I quit 6 months to 1 year ago
___ I quit more than a year ago

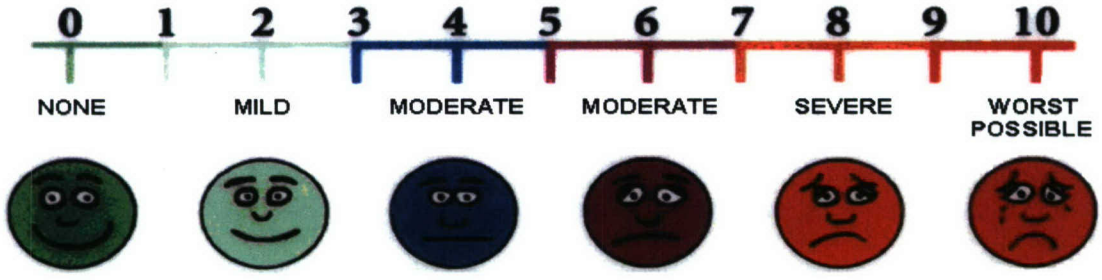
MEDICAL PROBLEMS AND MEDICAL CARE

12. PAIN WHILE SETTING UP OR TEARING DOWN. Do you currently have pain, soreness, discomfort, weakness, numbness, or tingling while on mission set-up or tear down?

___ Not Applicable (Go to Question 16)
___ No (If no, go to Question 16)
___ Yes.

a. If yes, in what part of your body do you experience the most pain, soreness, discomfort, weakness, numbness, or tingling while setting up or tearing down? _____

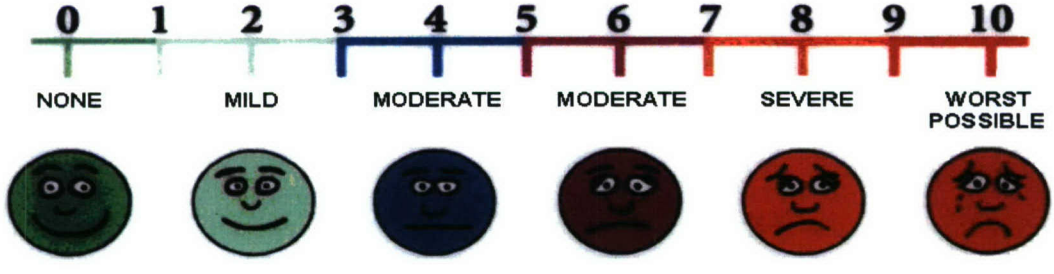
b. If yes, grade the pain, soreness, discomfort, weakness, numbness, or tingling for this part of your body (circle a number).



13. PAIN WHILE SETTING UP OR TEARING DOWN. Is there a second part of your body where you currently experience pain, soreness, discomfort, weakness, numbness, or tingling while setting up or tearing down?
___ No (If no, go to Question 16)
___ Yes

a. If yes what is this second part of your body where you experience pain, soreness, discomfort, weakness, numbness, or tingling? _____

b. If yes, grade the pain, soreness, discomfort, weakness, numbness, or tingling for this part of your body (circle a number).



14. PAIN WHILE SETTING UP OR TEARING DOWN. Are there other parts of your body where you currently experience pain, soreness, discomfort, weakness, numbness, or tingling when setting up or tearing down?
___ No
___ Yes

15. CHANGES DUE TO PAIN. Does pain, soreness, discomfort, weakness, numbness, or tingling ever cause you to modify the way you set-up or tear down?
___ Unsure
___ No
___ Yes. If yes, how do you modify your work?_____
_____

16. FOOT PROBLEMS: Do you have foot pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

17. KNEE PROBLEMS: Do you have knee pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

18. BACK PROBLEMS: Do you have back pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

19. SHOULDER PROBLEMS: Do you have shoulder pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

20. NECK PROBLEMS: Do you have neck pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

21. WRIST PROBLEMS: Do you have wrist pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

22. HAND/FINGER PROBLEMS: Do you have hand or finger pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

23. DENTAL PROBLEMS: Do you have problems with your teeth, jaws or embouchure (lips and tongue) that cause you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

24. VOCAL PROBLEMS: Do you have vocal pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

25. INJURIES YOU MIGHT HAVE HAD. Injuries include acute injuries (those that are sudden and unexpected) as well as overuse injuries (those involving pain that develops over time and might be chronic or recurrent). Did you have an injury during Calendar Year 2005 related to mission set-up or tear down (whether or not you sought medical care for these injuries)?
___ Not Applicable (Go to Question 27)
___ No (If no, go to Question 27)
___ Yes

26. INJURIES: If you had an injury in Calendar Year 2005 related to mission set-up or tear down, complete the information below. If you had more than one injury to a particular body part, list only the most serious one.

INJURED		BODY PART	DAYS OF LIMITED	TYPE OF INJURY	CAUSE OF INJURY
No	Yes		DUTY (profile)(if any)		
___	___	Vocal Cords	_____	_____	_____
___	___	Teeth/Jaws	_____	_____	_____
___	___	Head	_____	_____	_____
___	___	Neck	_____	_____	_____
___	___	Shoulders	_____	_____	_____
___	___	Upper Arm	_____	_____	_____
___	___	Lower Arm	_____	_____	_____
___	___	Wrist	_____	_____	_____
___	___	Hand	_____	_____	_____
___	___	Fingers	_____	_____	_____
___	___	Chest	_____	_____	_____
___	___	Upper Back	_____	_____	_____
___	___	Lower Back	_____	_____	_____
___	___	Abdomen	_____	_____	_____
___	___	Hip	_____	_____	_____
___	___	Thigh	_____	_____	_____
___	___	Knee	_____	_____	_____
___	___	Calf/Shin	_____	_____	_____
___	___	Ankle	_____	_____	_____
___	___	Foot	_____	_____	_____
___	___	Toes	_____	_____	_____

27. HEALTH CARE FACILITY. Where do you usually get your medical care?

___ Rader Health Clinic (Ft Myer)
___ Walter Reed Army Medical Center
___ DeWitt Army Community Hospital (Ft Belvoir)
___ Other military medical facility. Write name of facility _____
___ Civilian medical facility. Write name of facility _____

28. SATISFACTION WITH MEDICAL CARE. How satisfied are you with the quality of the medical care you have received at the medical facility?

___ Completely satisfied
___ Reasonably satisfied
___ Borderline
___ Moderately unsatisfied
___ Extremely unsatisfied

29. CHANGES YOU WOULD RECOMMEND. To reduce the possibility of injury, what two aspects of your job would you change (if any)?

1._____

2._____

HEARING

30. To what degree are you concerned about hearing loss from what you do in the Army Band?
___ Extremely concerned
___ Very concerned
___ Somewhat concerned
___ A little unconcerned
___ Not concerned

31. Do your ears ever ring and/or do you ever have a sensation of fullness in your ears after a practice session, rehearsal or performance?
___No
___Yes

32. Which statement do you think is true? Check all that apply.
____ Distorted music is more hazardous to your hearing than well played music at the same loudness level.
____ Listening to music through stereo earphones is potentially less hazardous to your hearing because more ambient noise and sound is blocked.
____ Hearing loss from loud noise or loud music can become permanent.
____ New developments in hearing aids can completely restore a hearing loss from hazardous noise back to normal hearing.

33. Do you take more than one aspirin a day on a fairly regular basis?
___No
___Yes

34. Which statement do you agree with the most? Check one.
____ We are going to lose our hearing in old age anyway so why all the fuss about hearing protection?
____ I value my hearing as my most precious learning and social sense.
____ I have to accept a certain amount of hearing loss as unavoidable.

35. Do you use hearing protection during rehearsals?
___Never
___Sometimes
___Always

36. Do you use hearing protection during performances?
___Never
___Sometimes
___Always

37. What problems do you have with hearing protectors? Check all that apply.
____ Interferes with my ability to monitor my performance
____ Interferes with my ability to monitor others' performances
____ Uncomfortable
____ Distorts the sound of my voice
____ Hearing protection is not available for band members
____ They don't work
____ I have no problems with my hearing protectors

38. Would you use a hearing protector that not only protected your hearing, but also enhanced your ability to hear others and monitor your performance?
___No
___Yes

39. Do you shoot skeet or frequent the rifle or pistol range as a hobby?
___No
___Yes

ADDITIONAL COMMENTS

40. Provide any additional comments or thoughts you might have. _____

_____

_____

_____

_____

4. Questionnaire for Army Band (Conductors)

In this questionnaire you will be asked about your health and your lifestyle. Please answer each question as accurately as possible.

Name _____

CONDUCTING AND PERFORMING

1. CONDUCTING FREQUENCY. How many days/wk did you rehearse, practice and/or perform in the last year, on average (including US Army Band activities and elsewhere)?

___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

2. CONDUCTING DURATION. On days when you rehearsed, practiced and/or performed in the last year, how long did you do this, on average (including US Army Band activities and elsewhere)?

___ None
___ Less than 30 min
___ 30-60 min
___ 61-120 min (1-2 hours)
___ 121-180 min (2-3 hours)
___ 181-240 min (3-4 hours)
___ 241-300 min (4-5 hours)
___ 301-360 min (5-6 hours)
___ 361-420 min (6-7 hours)
___ More than 420 min (more than 7 hours)

3. STANDING.

a. How much time do you spend standing when you rehearse, practice, or perform, on average?

___ None
___ Less than 30 min
___ 30-60 min
___ 61-90 min (1-1.5 hours)
___ 91-120 min (1.5-2 hours)
___ 121-150 min (2-2.5 hours)
___ 151-180 min (2.5-3 hours)
___ 181-240 min (3-4 hours)
___ More than 240 min (more than 4 hours)

b. What percent of the time do you spend standing when you rehearse, practice, or perform, on average?

___ None
___ 1-10%
___ 11-20%
___ 21-30%
___ 31-40%
___ 41-50%
___ 51-60%
___ 61-70%
___ 71-80%
___ 81-90%
___ 91-100%

4. WELLNESS INSTRUCTION

a. Wellness involves care of the body through diet, exercise, and rest. While in music school, did you receive instruction on wellness?

___ No
___ Yes

b. While in the Army, did you receive instruction on wellness?
___ No
___ Yes

5. RELAXATION WHILE CONDUCTING.

a. Do you usually feel relaxed when you conduct?
___ No
___ Yes

b. When conducting, do you deliberately work on relaxing your muscles?
___ No
___ Yes

6. SHOES. Do you have any problems with the shoes you wear for performances?
___ No
___ Yes. If yes, what are the problems? _____
_____

7. UNIFORMS. Do you have any problems with the uniforms you wear for performances?
___ No
___ Yes. If yes, what are the problems? _____
_____

EXERCISE AND SPORTS

8. AEROBIC EXERCISE

a. How many days per week did you perform aerobic exercise (running, cycling, swimming, etc.) in the last year, on average?

___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

b. On days when you performed aerobic exercise (running, cycling, swimming, etc.) in the last year, how long did you exercise, on average?

___ None
___ Less than 15 min
___ 15-30 min
___ 31-45 min
___ 46-60 min
___ More than 60 min

9. STRENGTH TRAINING

a. How many days per week did you exercise to improve your strength (free weights, universal, nautilus, push-ups, sit-ups, etc.) in the last year, on average?

___ None
___ Less than 1 day/wk
___ 4 days/wk
___ 5 days/wk

___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 6 days/wk
___ 7 days/wk

b. On days when you exercised to improve your strength (free weights, universal, nautilus, push-ups, sit-ups, etc.) in the last year, how long did you exercise, on average?

___ None
___ Less than 15 min
___ 15-30 min
___ 31-45 min
___ 46-60 min
___ More than 60 min

10. SPORTS ACTIVITY

a. How many days per week did you participate in sports activities in the last year, on average?

___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

b. On days that you participated in sports activities in the last year, how long did you participate, on average?

___ None
___ Less than 15 min
___ 15-30 min
___ 31-45 min
___ 46-60 min
___ 61-90 min (1-1.5 hours)
___ 91-120 min (1.5 to 2 hours
___ 121-150 min (2-2.5 hours)
___ More than 150 min (more than 2.5 hours)

11. OTHER PHYSICAL ACTIVITY

a. How many days per week did you perform other physical activity (like gardening, home repair, hunting, fishing, wood cutting, etc.) in the last year, on average?

___ None
___ Less than 1 day/wk
___ 1 day/wk
___ 2 days/wk
___ 3 days/wk
___ 4 days/wk
___ 5 days/wk
___ 6 days/wk
___ 7 days/wk

b. On days that you performed other physical activity (like gardening, home repair, hunting, fishing, wood cutting, etc.) in the last year, how long did you participate, on average?

___ None
___ Less than 15 min
___ 15-30 min
___ 31-45 min
___ 46-60 min
___ 61-120 min (1-2 hours)
___ 121-180 min (2-3 hours)
___ 181-240 min (3-4 hours)
___ 241-300 min (4-5 hours)
___ More than 300 min (more than 5 hours)

12. OVERALL PHYSICAL ACTIVITY. Overall, how would you rate yourself as to the amount of physical activity you perform, compared to others of your age and sex?

___ Much more active
___ Somewhat more active
___ About the same

___ Somewhat less active
___ Much less active

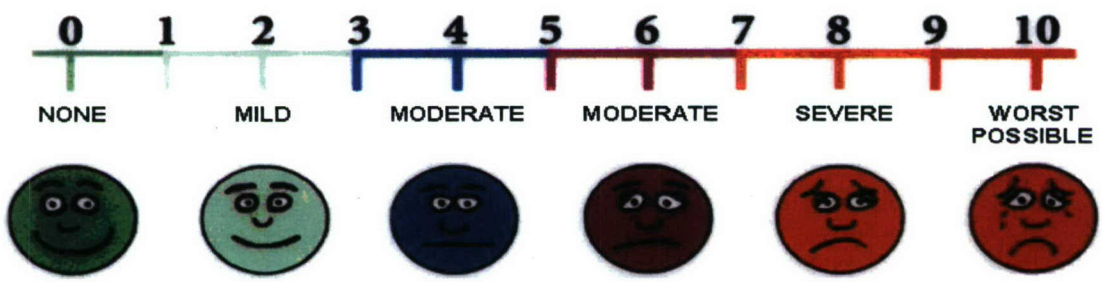
TOBACCO USE

13. SMOKING: Which statement best describes your smoking habits in the last year?
___ I have never been a smoker
___ I smoked but quit ----------→ ___ I quit less than 6 months ago
___ I smoke 10 or fewer cigarettes per day ___ I quit 6 months to 1 year ago
___ I smoke 11 to 20 cigarettes per day ___ I quit more than a year ago
___ I smoke more than 20 cigarettes per day

14. SMOKELESS TOBACCO: What statement best describes your use of smokeless tobacco (chewing, dipping or pinching) in the last year?
___ I have never used smokeless tobacco
___ I used smokeless tobacco but quit ----------→ ___ I quit less than 6 months ago
___ I use smokeless tobacco one time per day or less ___ I quit 6 months to 1 year ago
___ I use smokeless tobacco 2-4 times per day ___ I quit more than a year ago
___ I use smokeless tobacco 5-10 times per day
___ I use smokeless tobacco more than 10 times per day

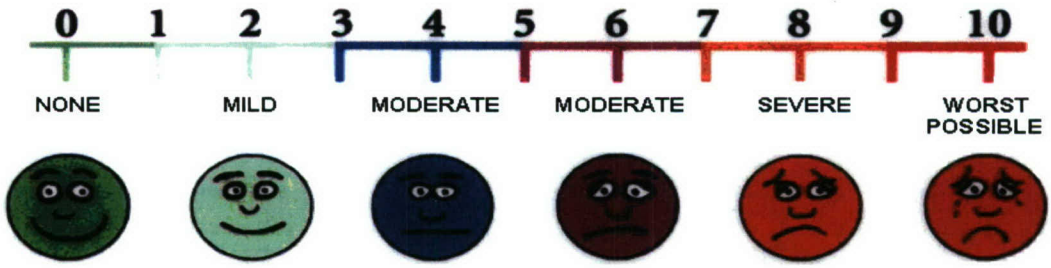
MEDICAL PROBLEMS AND MEDICAL CARE

15. PAIN WHILE CONDUCTING. Do you currently have pain, soreness, discomfort, weakness, numbness, or tingling while rehearsing, practicing, and/or performing?
___ No (If no, go to Question 19)
___ Yes.
a. If yes, in what part of your body do you experience the most pain, soreness, discomfort, weakness, numbness, or tingling while practicing or performing? _____
b. If yes, grade the pain, soreness, discomfort, weakness, numbness, or tingling for this part of your body (circle a number).



16. PAIN WHILE CONDUCTING. Is there a second part of your body where you currently have pain, soreness, discomfort, weakness, numbness, or tingling while rehearsing, practicing, or performing?
___ No (If no, go to Question 19)
___ Yes
a. If yes what is this second part of your body where you experience pain, soreness, discomfort, weakness, numbness, or tingling? _____

b. If yes, grade the pain, soreness, discomfort, weakness, numbness, or tingling for this part of your body (circle a number).



17. PAIN WHILE CONDUCTING. Are there other parts of your body where you currently experience pain, soreness, discomfort, weakness, numbness, or tingling when rehearsing, practicing, or performing?
___ No
___ Yes

18. CHANGES DUE TO PAIN. Does pain, soreness, discomfort, weakness, numbness, or tingling ever cause you to modify the way you conduct?
___ Unsure
___ No
___ Yes. If yes, how do you modify your holding or playing of the instrument?_____
_____

19. FOOT PROBLEMS: Do you have foot pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

20. KNEE PROBLEMS: Do you have knee pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

21. BACK PROBLEMS: Do you have back pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

22. SHOULDER PROBLEMS: Do you have shoulder pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

23. NECK PROBLEMS: Do you have neck pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

24. WRIST PROBLEMS: Do you have wrist pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

25. HAND/FINGER PROBLEMS: Do you have hand or finger pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

26. DENTAL PROBLEMS: Do you have problems with your teeth, jaws or embouchure (lips and tongue) that cause you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

27. VOCAL PROBLEMS: Do you have vocal pain, soreness, discomfort, weakness, numbness, or tingling that causes you to limit your daily activity some times?
___ No
___ Yes. If yes, is this caused by your participation in Band activities? ___ Unsure ___ No ___ Yes

28. INJURIES YOU MIGHT HAVE HAD. Injuries include acute injuries (those that are sudden and unexpected) as well as overuse injuries (those involving pain that develops over time and might be chronic or recurrent). Did you have an injury during Calendar Year 2005 related to conducting (whether or not you sought medical care for these injuries)?
___ No. (If no, go to Question 30)
___ Yes.

29. INJURIES: If you had an injury in Calendar Year 2005 related to conducting, complete the information below. If you had more than one injury to a particular body part, list only the most serious one.

INJURED		BODY PART	DAYS OF LIMITED DUTY (profile)(if any)	TYPE OF INJURY	CAUSE OF INJURY
No	Yes				
___	___	Vocal Cords	_____	_____	_____
___	___	Teeth/Jaws	_____	_____	_____
___	___	Head	_____	_____	_____
___	___	Neck	_____	_____	_____
___	___	Shoulders	_____	_____	_____
___	___	Upper Arm	_____	_____	_____
___	___	Lower Arm	_____	_____	_____
___	___	Wrist	_____	_____	_____
___	___	Hand	_____	_____	_____
___	___	Fingers	_____	_____	_____

___	___	Chest	_____	_____	_____
___	___	Upper Back	_____	_____	_____
___	___	Lower Back	_____	_____	_____
___	___	Abdomen	_____	_____	_____
___	___	Hip	_____	_____	_____
___	___	Thigh	_____	_____	_____
___	___	Knee	_____	_____	_____
___	___	Calf/Shin	_____	_____	_____
___	___	Ankle	_____	_____	_____
___	___	Foot	_____	_____	_____
___	___	Toes	_____	_____	_____

30. HEALTH CARE FACILITY. Where do you usually get your medical care?
___ Rader Health Clinic (Ft Myer)
___ Walter Reed Army Medical Center
___ DeWitt Army Community Hospital (Ft Belvoir)
___ Other military medical facility. Write name of facility _____
___ Civilian medical facility. Write name of facility _____

31. SATISFACTION WITH MEDICAL CARE. How satisfied are you with the quality of the medical care you have received at the medical facility?
___ Completely satisfied
___ Reasonably satisfied
___ Borderline
___ Moderately unsatisfied
___ Extremely unsatisfied

32. CHANGES YOU WOULD RECOMMEND. To reduce the possibility of injury, what two aspects of your job would you change (if any)?

1. _____

2. _____

HEARING

33. To what degree are you concerned about hearing loss from what you do in the Army Band?
___ Extremely concerned
___ Very concerned
___ Somewhat concerned
___ A little unconcerned
___ Not concerned

34. Do your ears ever ring and/or do you ever have a sensation of fullness in your ears after a practice session, rehearsal or performance?
___No
___Yes

35. Which statement do you think is true? Check all that apply.
____ Distorted music is more hazardous to your hearing than well played music at the same loudness level.
____ Listening to music through stereo earphones is potentially less hazardous to your hearing because more ambient noise and sound is blocked.
____ Hearing loss from loud noise or loud music can become permanent.
____ New developments in hearing aids can completely restore a hearing loss from hazardous noise back to normal hearing.

36. Do you take more than one aspirin a day on a fairly regular basis?
___No
___Yes

37. Which statement do you agree with the most? Check one.
____ We are going to lose our hearing in old age anyway so why all the fuss about hearing protection?
____ As a musician, I value my hearing as my most precious learning and social sense.
____ As a musician, I have to accept a certain amount of hearing loss as unavoidable.

38. Do you use hearing protection during practice sessions?
___Never
___Sometimes
___Always

39. Do you use hearing protection during rehearsals?
___Never
___Sometimes
___Always

40. Do you use hearing protection during performances?
___Never
___Sometimes
___Always

41. What problems do you have with hearing protection? Check all that apply.
____ Interferes with my ability to monitor my performance
____ Interferes with my ability to monitor others' performances
____ Uncomfortable
____ Distorts the sound of my voice
____ Hearing protection is not available for band members
____ They don't work
____ I have no problems with my hearing protectors

42. Would you use a hearing protector that not only protected your hearing, but also enhanced your ability to hear others and monitor your performance?
___No
___Yes

43. Do you shoot skeet or frequent the rifle or pistol range as a hobby?
___No
___Yes

ADDITIONAL COMMENTS

44. Provide any additional comments or thoughts you might have. _____

_____

_____

_____

_____

_____

Appendix E
After Action Reports on Band Observations

1. Support Element Set Up at Strathmore Performing Arts Center

On 7 April 2006 Keith Hauret, Donald Goddard and Joseph Knapik observed the Army Band Support Group set up for a Band concert in the Music Center at the Strathmore Performing Arts Center. Our major conversations were with MSG Twombley, SGM Eeisen, and MSG Reese.

Equipment arrived in 4 large utility trucks driven by civilian employees. The off loading was done by Soldiers and began about 0930. The entire off loading procedure (all 4 trucks) took about 20 minutes. The truck pulled up to two indoor off-loading ramps where the Soldiers who performed the offloading were fully sheltered (it was raining outside). About 95% of the Band equipment was in rolling containers which made the offloading very efficient. A dolly was used at least once to move a group of paper boxes. A single very tall container had to be dragged off the truck and lifted upright to be placed on its wheels. Some music stands and tables were manually offloaded.

The equipment was moved about 10 yards (estimated) to an area that had an elevating stage. A few crates were unloaded at this point (off the elevating stage) but the large majority of crates were placed on the elevating stage. The elevating stage was about 15 feet by 80 feet (estimated). Crates that were unloaded contained cymbals on wheels, xylophones on wheels, chimes on wheels, plus other objects. The elevating stage slowly lifted all the equipment and personnel into the concert area.

The concert area was very large (seating capacity 1974). The elevating stage was placed just below the main stage, at the level of a large enclosed area off to the right of the stage. Crates were rolled off the elevating stage into the enclosed area. Many of the crates contained sound equipment so that once the side and back were removed, the equipment was exposed and could be hooked up to cables and other equipment. Other crates contained very heavy cables with highly variable weights (estimated one at 40 lbs). A number of crates contained music stands (for sheet music). There was one very large device described as a "recorder" that was 2X4 feet (estimated) and very heavy.

Several suggestions were provided by support group members for reducing work stress and improving efficiency of the Support Group. The trucks they currently have contain elevating ramps that are not optimal because they "tilt in the wrong direction". A better ramp was described that has controls that adjust the tilt of the ramp. This is helpful when unloading on uneven or sloped terrain. Some ramps have a lip around the edge to prevent rolling off the ramp. An incident was cited in which a Soldier attempted to prevent a heavy cart from rolling off the ramp and was injured. Another suggestion was to obtain wheels for the crates that would last longer and would have a lower coefficient of friction for easier rolling. A final suggestion was a "slick" sheet that allowed boxes and crates to be moved easily across them.

The Support Group Soldiers considered this a very easy set-up because the equipment did not have to be moved far, the concert hall provided much of the equipment (the support group was required to provide less), and some labor was provided by the concert hall support staff. The Support Group Soldiers described more difficult set ups that involved grass, uneven terrain, and long distances over which carts had to be pushed and pulled.

Most of the set-up was completed by 1030, although the sound and lighting crew continued to adjust their equipment. We departed by 1100.

2. Support Element Set-up for Twilight Tattoo

On 1 May 2006, Salima Darakjy, Donald Goddard, Ben Bunger, and Joseph Knapik observed the Army Band Support Group set up for a band concert in front of the Jefferson Memorial in Washington DC. The weather was cool (45-50^{0}F) and sunny.

The sun rose as the Band Support group arrived at 0555. Band equipment was contained in 2 large utility trucks driven by civilians. The off loading was done by support group Soldiers and only took ~20 minutes to complete. The truck pulled up to a security ramp that blocked the driveway leading to the memorial. The back of the memorial was about 75 yards away. About 95% of the Band equipment was in rolling containers which made the off loading very efficient. The routine procedure was to roll a container onto a hydraulic ramp at the back of the truck, then lower that ramp to ground level. Once at ground level, the containers were rolled off the ramp on to the asphalt. The ramp would be raised for the next item. A few items (sheet music stands, tables, plastic ramps) were not in containers. A large number of plastic "ramps" that served to protect wires across high traffic areas were not in containers and had to be offloaded from the truck then manually loaded onto a 4-wheeled dolly. Once about ½ of the items were offloaded, several of the Soldiers began rolling the containers to the front of the memorial about 125 yards away while other Soldiers continued the off loading. Once all the items had been offloaded they were also rolled to the front of the memorial. Soldiers generally had to lean over (trunk flexion angle about 45^0) to push many of the wheeled containers since they sat very low to the ground. Soldiers pushing 2 very large and heavy speaker stands were especially flexed at the trunk since the stands sat very close to the ground. Larger wheels on the containers may make it easier to push the containers.

Once all the equipment was at the front of the memorial the set-up began and Soldiers worked in small groups to accomplish this. One group walked some heavy equipment up 8 steps of the memorial. This equipment included a very large (about 3' X 3') and heavy (estimate 50 lbs) control panel that was placed on two tables. These tables had doubled as the sides of 2 containers holding audio equipment. The audio equipment containers (estimated at 40 lbs) were also walked up the steps and placed next to the control panels remaining on their container wheels.

Other Soldiers were working at the lower end of the memorial. One Soldier manually pulled very heavy audio cabling, unwinding it from a spool. The Soldier dragged the cable parallel to the memorial, then perpendicular up the steps to the control panel. About 50 yards of cable was pulled out on 2 occasions.

A group of Soldiers including the senior NCO was setting up 2 arrays of speakers. Before the speakers could be set up, a hoist had to be situated. The 4 legs of the hoist were spread and supports on these legs were manually screwed down. This did not require much force on the part of the person operating the screw. An array of 6 double speakers was contained on a wheeled apparatus (about 1 X 1.5 X 6 feet) separate from the hoist. This vertical array was strapped to the hoist and raised horizontally such that the bottom of the array was about 10 feet from the ground and the top of the array about 16 feet above the ground. To raise the speakers one of the Soldiers operated a double handled crank attached to a pulley system providing considerable mechanical advantage; it did not require much force on the handles to lift the very heavy speaker array. Two of these were set up, one on either side of the seats for the performers.

Other Soldiers were setting up metal folding chairs and music stands the performers would use. Apparently, the chairs the performers were to be seated in were folding metal chairs. Metal folding chairs provide for efficiency in storage space and ease of transportation but may not be ideal for the comfort of the musicians while playing. The stool for the keyboardist seemed particularly uncomfortable and potentially unstable or unsafe. It was a cross-bar folding stool with short metal feet and a modestly padded smooth seat surface. There are musical chairs that could provide more seat cushioning and ease proper posture but they are pricey and might take more storage space than the folding metal chairs (see Discussion section on "Change Chairs"). The portion of the Band that was to be

performing appeared to be the Blues Ensemble since a sign was posted to this effect in front of the area where the performers would to be located. We departed at about 0715.

3. Full Honors Funeral

On 9 May 2006, Keith Hauret, Donald Goddard, Salima Darakjy, Jonathan Drum, Jeffrey Hadley, Sarah Jones, and Joseph Knapik observed the Army Ceremonial Band perform a full honors funeral at Arlington National Cemetery, VA. We were escorted by SGM Dennis Eddelbrock. SGM Eddelbrock estimated that the Band supported full honors funerals about twice a day, 4 days a week.

We observed the Band members in distinctive uniforms loading into a bus with their instruments at Ft Myer's Bruckner Hall at about 1030. They were transported to a staging area in the cemetery about 1/2 mile away. According to SGM Eddelbrock, there are several predetermined staging areas where the remains of the deceased are transferred to the funeral caisson. This is done when the funeral does not originate with a service at the Ft Myer chapel with procession through the Chapel Gate. Staging areas are selected in advance in order to maintain distance between, and distinct routes for, separate services taking place simultaneously in the cemetery. The distance and terrain (hills) the ceremonial band traverses on the march to the gravesite varies by mission and depends on the staging area selected and the burial section.

We drove to the cemetery, arriving about 1040. We observed the Band forming up with elements of the Old Guard, the latter holding M-14 rifles. Heavier Band instruments (sousaphones, euphoniums, drums) were on the ground while lighter instruments were held in the musician's hands (piccolos, flutes) or supported on their arms (French Horns, trumpets). Trombones appeared to be held in hands with slides supported on the ground. At 1105, on command, the Band members who had their instruments on the ground picked them up and came to attention as did the other band members. The position of attention varied for each instrument and SGM Eddelbrock said that this was specified by SOP. The band played a tune, and shortly afterwards marched in front of a horse-drawn caisson carrying the casket of the deceased. Another tune was played early in the route. Euphoniums appeared to be held upside down and were not played on the march. Sousaphones were carried on the opposite (right) shoulder and were not played while on the march. We reentered our vehicles and traveled to the gravesite.

When we arrived at the gravesite, the Band and the Old Guard had just arrived. The march to the gravesite may have been ¼ to ½ mile although we only observed a small portion of the march. The Old Guard marched the Band into position near the gravesite. They were on uneven terrain, standing over gravesites on a small hill, apparently unable to select a level area. The Band played music at the start of the ceremony and after the ceremony had been completed. After the Band played the first hymn at the gravesite, the bugler walked approximately 25 meters to stand adjacent to the Old Guard soldiers. To reach this spot, the bugler walked between the grave markers over the groomed but somewhat uneven terrain. The bugler stood about 5 meters away from the riflemen who each fired 3 volleys (21-gun salute) before the bugler played Taps and then walked back to rejoin the Band. The bugler did not appear to be wearing hearing protection and the rifle rounds were quite loud from our position approximately 8 meters away.

We observed the Band members playing their instruments at the gravesite. When the sousaphone was played, it was on the left shoulder and when at parade rest it was on the right shoulder. There were thin pads wrapped around the parts of the instrument that rested on the shoulder and touched the hip. The trumpet was held in one hand supported by the arm at a 90° angle when at attention, and held in both arms near the body center when at parade rest. There were two drums in the Band. The large bass drum had to be rotated to a 45° angle when played so the drummer could strike the top surface with mallets in both hands. This appeared to be an awkward position but if the drum was rotated to 90° it may not have been possible to play it at all. The bass drum was supported by a strap that was over the drummer's shoulder.

At the conclusion of the ceremony the Band marched off the grass onto the asphalt road and down to the bus that was awaiting them. The distance from the gravesite performance area to the bus was about 50 yards. The ceremony concluded at about 1145 and we departed. The Band loaded into the bus for return to Bruckner Hall.

4. Anniversary Concert

On 7 April 2006, the US Army Band presented selections from their 84th Anniversary Concert repertoire at The Music Center at Strathmore in Bethesda, Maryland. The Concert program is at Figure E1. Michelle Canham-Chervak, Sara Canada, Sarah Jones, and Salima Darakjy observed the concert. The Band performed for an audience of approximately 1000, including distinguished World War II Veterans and other honored military guests. The Ceremonial Band did not appear at this venue.

The concert opened at 2015 with an introduction by the Commander of the Military District of Washington, MG Guy Swan III, and the singing of the National Anthem. Next, the Army Blues Jazz Ensemble played two arrangements, including an elaborate work commemorating New Orleans and Hurricane Katrina that was composed by SFC Graham Breedlove, a trumpet player in the group. Both selections showcased the trumpet, saxophone, trombone, and drum sections; the piece by SFC Breedlove included lengthy solos for the trumpet and drums. Most Jazz Ensemble performers were seated as they played; the bassist, guitarist, and solo trumpeter were standing for most of the set or solo section.

The Army Chorale subsequently joined the jazz ensemble for a unique interpretation of The Army Song followed by two other works. Chorale members performed wearing the Army Dress Blue uniform, as did all other Band members, except as noted. The Chorale executed choreographed dance steps while singing to the music. Routines included both partnered dancing with male and female performers and line formations of independent dance moves. All vocalists used hand-held microphones throughout the concert. Unlike the leaders of other Band elements, the Chorale Conductor, CPT Domingos Robinson, introduced and directed each piece and also performed solo and group vocals and dancing. The height range of Chorale members was noticeable but did not appear to affect the partnered routines. That is, stature might have been a factor in partnering for duet dancing or the performers are skilled in adapting when height differences exist. One of the female Chorale members performed demanding vocal solos along with the dancing while noticeably pregnant.

A moving performance by the Army Strings punctuated the first half of the concert. Female violists and cellists wore trousers with the Army Dress Blue uniform in order to accommodate their musical instruments and maintain playing posture. The scheduled intermission time that followed was extended due to technical difficulties resulting from inclement weather. During the intermission, members of the Support Group rearranged stage components into the configuration used for the Concert Band.

Standing above the stage at the mezzanine level and wearing their own distinguished uniform, the Army Herald Trumpets opened the second half of the concert playing a two- to three-minute arrangement from the Liberty Fanfare by John Williams. Next, the Concert Band took to the stage, conducted by COL Thomas Rotondi, Jr., Commander, US Army Band. The performers and the audience were asked to stand and acknowledge the distinguished guests; the Concert Band subsequently performed four works representing various genres. Their set was followed by the Army Chorus, an all-male group, singing from the mezzanine level. In contrast to the animated and physically dynamic performances of the Chorale, the Chorus members remained stationary while singing. Chorus books were used during some but not all of the songs.

Two vocal selections closed the program, including the last piece for which the audience was asked to stand and join by singing. The concert concluded at 2230 after two encores that included all of the elements that performed during the program. As the audience departed, the Support Group initiated take-down of the equipment. The concert hall provided skilled assistance and much of the equipment used for the concert. Observations were not

conducted for the complete equipment recovery process however it was likely similar to the set-up process at this venue described in another report. Performers departed the concert hall on Ft Myer buses.

General Observations:

1. Approximately 20 Band members were posted as "greeters" throughout the concert hall. They wore the Army Band uniform and were standing and escorting guests at the start and end of the concert as well as during the intermission.
2. The concert was organized such that each group performed one to two pieces sequentially then had a brief respite on stage while the next sequence was introduced by the announcer. These breaks did not exceed two minutes.
3. All music was amplified.
4. The trumpet section projected directly into the back of the trombonists' heads; the French horn players sat directly in front of the percussion section.
5. The trumpet soloist (Jazz arrangement), bassist, and most percussionists were standing for nearly all of their playing time.
6. Instrumentalists in the woodwind, brass, and string sections sat erect (not slouched) on the forward part of their chairs.
7. Typical musician chairs were used; they had metal frames with cushioned seat and backrest surfaces but were not adjustable and did not have armrests.
8. Chorale choreography was not elaborate but was likely physically demanding while simultaneously singing.
9. One Band member from the Support Element filmed the entire event using a professional camera that appeared to be 20x8x8 inches (typical weight for such models is 12-15 pounds). The camera man alternated vantage points throughout the concert, repeatedly moving between the orchestra and mezzanine levels while carrying the equipment. At the orchestra level, the camera was supported on a moveable stand positioned on the ground immediately in front of the stage. The stand could pivot (pan) and slide across the width of the stage area. Some of the orchestra-level filming and all filming at the mezzanine level were done free-hand with the camera supported on the shoulder. The camera man was dressed in a black long-sleeved polo shirt and trousers; he presumably wore black athletic shoes to facilitate comfort and quick and discreet movement during the performance although it was difficult to determine from our vantage point.

Figure E1

from Washington, DC

The U.S. Army Military District of Washington
Major General Guy C. Swan III, Commanding General
presents

The United States Army Band "Pershing's Own"

Colonel Thomas Rotondi, Jr., Leader and Commander
Sergeant Major Ross N. Morgan, Jr., Enlisted Leader

84TH ANNIVERSARY CONCERT

8:00 p.m., Friday, April 7, 2006
The Music Center at Strathmore, North Bethesda, Maryland
Sgt. Maj. Michael Dudley, Announcer

National Anthem . . . . . Francis Scott Key
Sgt. 1st Class Caleb Green, baritone

Better Get Hit in Your Soul . . . . . Charles Mingus
arr. Master Sgt. Craig Fraedrich [1]

Nola's Lament/Nola's Return . . . . . Sgt. 1st Class Graham Breedlove [2]
The U.S. Army Blues Jazz Ensemble
Chief Warrant Officer Charles Vollherbst, Conductor

The Army Song . . . . . Harold W. Arberg and Edmund Gruber
arr. Dwayne Milburn [2]

Those Jumpin' 40s . . . . . arr. Sgt. Maj. (ret.) Mark Taylor [3]

God Bless the U.S.A. . . . . Lee Greenwood
arr. Sgt. Maj. (ret.) Mark Taylor [3]
Sgt. Maj. Michael Dudley, bass
The U.S. Army Chorale
Capt. Domingos Robinson, Conductor

Adagio for Strings . . . . . Samuel Barber
The U.S. Army Strings
Maj. Jim Keene, Conductor

America Means Everything to Me . . . . . Master Sgt. Louis Durham [2]
arr. Master Sgt. Paul Murtha [4]
Sgt. 1st Class Fred Lamb, tenor
The U.S. Army Blues Jazz Ensemble, Chorale, and Strings
Capt. Domingos Robinson, Conductor

~ INTERMISSION ~

Liberty Fanfare . . . . . John Williams
arr. James Curnow

The U.S. Army Herald Trumpets
Capt. Derrick N. Shaw, Conductor

El Camino Real . . . . . Alfred Reed

National Emblem March . . . . . Edwin E. Bagley

American Anthem* . . . . . Gene Scheer
arr. Sgt. 1st Class Douglas Richard [5]

Staff Sgt. Leigh Ann Hinton, soprano

Benny Goodman: Memories of You . . . . . arr. MUCS (ret.) Bryan Kidd [6]
Sgt. 1st Class Dennis Strawley, clarinet; Sgt. 1st Class Glen Gurnard, vibraphone;
Staff Sgt. Harold Summey, drums;
Master Sgt. Louis Durham, piano; Master Sgt. Michael McReynolds, bass

The U.S. Army Concert Band
Col. Thomas Rotondi, Jr., Conductor

In taberna quando sumus from Carmina Burana . . . . . Carl Orff
arr. John Krance

Seeing Nellie Home . . . . . J. Fletcher
lyrics, Frances Kyle
arr. Alice Stuart Parker and Robert Shaw

America (My Country 'Tis of Thee) . . . . . Henry Carey/Samuel Smith
arr. Maj. Jim Keene [2]

Battle Hymn of the Republic . . . . . William Steffe
lyrics, Julia Ward Howe
arr. Peter J. Wilhousky

The U.S. Army Chorus
Lt. Col. John Clanton, Conductor

Shenandoah—Ragged Old Flag . . . . . Frank Ticheli
lyrics, Johnny Cash
arr. Sgt. 1st Class Michael C. Brown [7]

Sgt. Maj. Michael Dudley, narrator

God Bless America . . . . . Irving Berlin
arr. Sgt. Maj. (ret.) James C. Kessler [3]

1. Member, The U.S. Army Band
2. Former officer, The U.S. Army Band
3. Former Chief Arranger, The U.S. Army Band
4. Chief Arranger, The U.S. Army Band
5. Arranger, The U.S. Military Academy Band at West Point
6. Former member, The U.S. Navy Band
7. Arranger, The U.S. Army Band

* Used by permission. Music can be ordered at www.geneschreer.com

5. Second Full Honors Funeral

On 9 May 2006, Michelle Chervak, Steve Bullock, and Tim Mitchener observed the Army Ceremonial Band perform a full honors funeral at Fort Myer/Arlington National Cemetery, VA. We were escorted by MSG Twombley.

At 0815, approximately 30 band members, dressed in their traditional black wool dress uniforms and lead by a Drum Major, proceeded from Bruckner Hall across the street to the parking lot across from Bruckner Hall. There, they remained in a group under tree cover in conversation. It was a cool, overcast day. We were told that the Band members would routinely wear only a cotton T-shirt or other like garment beneath the wool jacket, even on cool days. On warm days, we are told that these uniforms become extremely uncomfortable. At 0840, the Band was called to attention and marched with the Old Guard to the Ft Myer Chapel. The Band followed after the Guard, with the bass drum providing a slow cadence for all. The Chapel was about 500 feet away; we remained at Bruckner Hall, observing from there so as to not disrupt the ceremony. When not playing, the Band remained at attention or parade rest. At 0845, the Band played for approximately 5 minutes while the casket was moved from the hearse into the chapel. Once the casket was inside the chapel, the Band marched back to their starting point in the parking lot of Bruckner Hall and was dismissed by the Drum Major for 15 minutes. At 0915, the Band gathered in the parking lot once again and marched back to the chapel with the Old Guard. At 0920, the Band played while the casket was transported by the Old Guard from the chapel to the horse-drawn caisson that would be used to transport the remains to the burial site in Arlington Cemetery.

At 0925, the Band, caisson, and Old Guard proceeded through the Ft Myer gate onto Arlington Cemetery grounds. They marched along the asphalt roads of the Cemetery for 1.5 miles to the burial site. No potholes were observed along the route and the procession proceeded down the center of the road (the roadway had just recently been repaved). As consistent with the grounds of Arlington Cemetery, the route included gradual declines, one steep decline, and a gradual incline at the end. The Drum Major had the Band play approximately twice while marching on level ground or slight inclines/declines.

The burial site was at the edge of the Arlington grounds, approximately 50 yards from the closest paved road, on a slight hill with a view of the west side of the Pentagon. The band was positioned approximately 75 yards off the road, above and to the left of the burial site (approximately 10 o'clock position). We remained at the base of this hill, approximately 50 yards from the Band, so as not to disturb the ceremony. At 0955, the Band played as the casket was moved from the caisson to the burial site. America the Beautiful was played as the flag was presented to the widow. Although we could not see the firing party from our position, the traditional 21 rounds in three volleys appeared to come from above and to the right of the burial site (approximately 2 o'clock position), a distance of approximately 150 feet away from the Band members. A single bugler played taps to conclude the ceremony. The Band and Old Guard marched approximately 150 yards to school busses stationed nearby and, at 1015, Band members loaded onto the bus. The bus transported us back to Bruckner Hall.

Some topics discussed with MSG Twombley:

- Heat. The black wool uniforms are required dress for funerals; that is not likely to change (although dress whites could be the protocol for other events during the summer?). Some methods he personally used to reduce and monitor the effects of heat: cutting plastic lining of the hat, substantial hydrating the day before (one gallon of water), monitoring his pulse. He suggested that a reflective coating on the top of the hats would be extremely beneficial to reducing heat on the head, in addition to changing the shoes to a material that breathes better and resists heat transfer from pavement.

- Cold. The cold can also be an issue in Arlington. Outdoor ceremonies are conducted as long as the temperature is above 32 degrees. They are allowed to wear overcoats. Freezing rain is not uncommon.
- Yellow jackets. Arlington is well-sprayed with pesticides to keep the mosquito population in control. However, yellow jackets, with nests in the ground, are plentiful in Arlington Cemetery. They are typically not a problem if left alone (not swatted).
- Pro-active medical care. Could an appointment with a podiatrist be part of in-processing (to catch problems before they become painful)? Are there identifiable risk factors for developing foot or other lower extremity pain from standing that orthotics can help with that are different from orthotics used for walking or running?
- Leadership Command and Control.
    - Currently the relationship between the Old Guard and Army Band Command is at its zenith. Historically they have not enjoyed such an amiable relationship which has hampered some operations. Perhaps a review and development of memorandum of understanding or memorandum of agreement would facilitate future operations.
    - Old Guard. During ceremonies, the Band must follow the lead of the Old Guard, often a lieutenant who may not have much experience. Many of the most difficult situations they have experienced (lengthy heat exposure, standing at attention) have been the result of moving into position too soon, something which the Band does not control.
    - The U.S. Military District of Washington (MDW). The Army Band, unlike the other Service's bands, is directly tied to MDW, which plans all major military public events in the Washington area. Therefore, the Army Band gets the bulk of requests for services compared to the other Service bands (Navy, Marine, Air Force) that are also in the Washington area.

6. Herald Trumpets Rehearsal

On 7 April 2006, the US Army Band Herald Trumpets rehearsed musical excerpts for upcoming events at the White House and other venues. Joseph Knapik, Salima Darakjy, and David Bensch observed the session which took place in an auditorium in Bruckner Hall. We were escorted by a vocalist in the Army Chorale, MSG Beverly Benda.

When we arrived at 0800, two soldiers from the Support Element were preparing the rehearsal hall by checking lighting and sound equipment. They departed less than five minutes after our arrival. Meanwhile, one percussionist on the marimba and one trumpet player were practicing independently on the stage, playing scales and generally warming up. The percussionist subsequently stopped practicing to guide us through the backstage area where instruments were stacked in front of and stored on shelves. The non-percussion instruments were stored in hard-sided, wheeled cases; some of the drums had protective covers but were ready to be played. The percussionist wheeled three hammered copper timpani, a cymbal on a stand, and a chair to the front center stage and positioned them for the rehearsal. As other musicians arrived, they prepared their instruments and cleared approximately 60 audience chairs from the floor of the hall to create sufficient space for the Herald Trumpets formation.

Prior to the formal start of the rehearsal, we obtained weights for the various trumpets. Three musicians were instrumented with noise dosimeters; they were selected to obtain measurements from different sections (musical keys) of the group's formation. The trumpet players stood in their "V" formation and we determined the distance from the bell of the center trumpet player to the conductor to be 37 feet. Various sound meters were placed at specific locations in the rehearsal hall; a portable unit was also moved around the room at intervals over the course of the rehearsal.

The conductor, CPT Derrick Shaw, officially started the session at 0830. The conductor used a baton to direct the instrumentalists on tempo and sound as well as when to raise and lower their instruments for play. His feet remained stationary; he used his arms and shoulders in very precise, large motions. Thirteen trumpet players and three percussionists played instruments during the session. Situated on the stage on the right front center, two of the percussionists each played a rope field drum suspended from a single harness strap worn diagonally over the body. The striking surface of the drum fell approximately at hip level; the bottom of the drum was approximately 6 inches below the knees. The third percussionist played the timpani and cymbal and was seated on a contoured (padded), pivoting chair with a backrest. To play the timpani and cymbals, the drummer had to frequently pivot back and forth to reach the striking surface of the different instruments. Therefore, he was seated on the forward edge of the chair and did not use the backrest during the session. The trumpet players stood in their typical formation on the floor of the auditorium and in front of the stage. Each trumpet was outfitted with a tabard, the ceremonial banner that hangs from the straight pipe on the musical apparatus. All instrumentalists were dressed in the Class B uniform; the conductor was wearing the battle dress uniform (BDU). None of the Band members were wearing hearing protection.

Approximately 20, ½ to 2-minute excerpts from various arrangements were practiced consecutively. The trumpet players stood in a "V" formation at a modified position of attention, clasping the trumpet with two hands near the valves, holding the instrument horizontally at waist-level and pointed toward the center of the formation at a 30-degree angle to the body. This was the start and end position for each piece practiced. At the conductor's directive, the trumpet players raised their instruments to the playing position in one of two ways: regular or sweeping movement. The regular movement required the instrumentalist to laterally pivot the trumpet to a 90-degree angle to the front of the body, shift the apparatus forward horizontally and away from the body, lift it to mouth level and then pull the instrument horizontally toward the mouth. Each player maintained a two-handed grasp on their trumpet, shifting their grip when necessary. After playing the required tune, instrumentalists returned to the modified position of attention using similar movements in reverse. The sweeping movement required the instrumentalist to pivot the trumpet downward in a semicircular motion, pointing the bell toward the ground and raising it again to waist level, then subsequently lifting the instrument to the mouth. After playing the required tune, instrumentalists returned to the modified position of attention using the regular movement in reverse. For most, playing posture involved standing with heels together with straight legs and back, while supporting most of the trumpet's weight with the left hand and working the valves with the fingers of the right hand. The elbows were vertically lifted 45 degrees and held away from the body; the chin was also lifted. It is interesting to note that the sole female trumpet player appeared to have adapted her playing posture due to her rather small body frame. She seemed to bend her knees and arch backwards slightly in order to support her instrument. Since the starting and ending positions also required the trumpet player to support the instrument in a certain manner, the only brief intervals for rest and relaxation of the shoulders, arms, back, or feet were at the end of selections that required march-off practice or in between selections that called for rearranging the different sections (musical keys). When "marching off-stage", the instrumentalist grasped the trumpet with the right hand near the valves, bell pointing toward the ground, and held the apparatus fairly still vertically next to the right leg while exaggerating the swinging motion of the left arm in marching step. Another short period of relaxation occurred 2/3 of the way through the rehearsal during a drums-only sequence lasting approximately 2 minutes.

The percussionists played at intervals during the rehearsal; the timpani were involved to various degrees in each excerpted arrangement while the rope field drums were played for all but one selection. Still, the rope field drums were worn and the players remained standing for the duration of the rehearsal. During the piece in which they did not play, the percussionists on the rope field drums were practicing complicated and rapid drumstick movements in the air for the upcoming selection. The drums-only selection was quite impressive and involved intricate and fast drumbeats and hand movements with wooden drumsticks, sometimes tossing them low in the air and catching them. The movements were synchronized and the players stood fairly close to one another with heels together and straight legs and backs. Their posture was relatively static with very controlled movements while playing. By contrast, the musician playing the timpani and cymbal used felt-tippet drum mallets and could make

more energetic body movements while pivoting among and striking the instruments due the nature of the apparatus: the rope and field drum is used for drill routines while the timpani is more of a concert instrument that requires high striking forces to create sound with those particular drum mallets.

We departed at the conclusion of the rehearsal at 0930.

7. Twilight Tattoo

On 21 June 2006, Sarah Jones, Sara Canada and Joseph Knapik observed the Twilight Tattoo at the Tidal Basin end of Jefferson Memorial in Washington DC. The Army Blues Jazz Ensemble Band and four members of the US Army Chorale performed along with members of the Old Guard Marching Unit, the Old Guard Salute Gun Platoon, the Old Guard Fife and Drum Corps, the US Army Drill Team, and an honor guard. Estimated (not measured) temperature was 90° F and humidity 80%.

The Blues Jazz Ensemble began playing some jazz and other tunes at about 1830. Band members were seated and dressed in white short sleeve shirts and long blue pants. All band members appeared to be male. The band appeared to have a single percussionist, several trumpets, saxophones, trombones, a keyboard, two guitars, a flute, a piccolo, and possibly other pieces (we observed from a distance in the crowd). At about 1900 four Chorale members (2 men, 2 women) came out wearing black US Army T-shirts, Army combat uniform (ACU) pants and desert boots. The Chorale members sang and danced very energetically to popular rock and roll music played by the band.

At about 1900 an announcer began the formal performance and the Guns platoon fired off several blank rounds from small ceremonial cannons. The announcer then introduced various groups of people who were in the audience. The Band played the National Anthem with a single female member (now dressed in standard ACUs) of the Chorale singing the lyrics. The Old Guard Marching Unit performed a march-by followed by the Old Guard Fife and Drum Corps. The Old Guard Fife and Drum group (11-hole fifes, bugles and drums) were dressed in colonial period outfits. They played several classic pieces and some very fast (and apparently difficult) pieces on the fife. Throughout most of the show they performed precision marching movements. The Blues Band was not playing while the Fife and Drum Corp performed.

Shortly after the Fife and Drum Corp performances, a female Chorale member sang America the Beautiful and another female chorale member then sang God Bless America accompanied by the Blues Band. Then 2 male chorale members joined the two females members and they all sang a patriotic country song. The chorale members then exited behind the Band. The Fife and Drum Corps marched off while the US Army Drill team marched on. The Drill Team performed precision formation and marching movements using ceremonial M-14s with bayonets attached. M14 movements included shouldering, twillering, and tossing actions. The final performance involved the "daring front-to-rear-overhead rifle toss" which required the unit to be in tight formation with the front rank tossing the weapon rearward, two-end-over-end rotations, to be precisely caught by members of rear of the formation. The Blues Band played for portions of the Drill team performance.

The Old Guard then marched in front of the Band with each Old Guard member holding one of the 56 state and territorial flags. Reenactors in period military costumes were introduced one at a time representing about 14 major periods in American history. Two reenactors were on horseback. Reenactors took up positions in front of the flags while the Band played. After all the reenactors were positioned the Band played two more pieces. The chorale members then sang the theme song for each branch of service and asked audience members to stand and participate with the song if they had a special connection to any of the branches of service. After this the Old Guard marched the flags to center stage one at a time while the announcer called off the states and territories along with the state nicknames. The Band played while the flags were marched to center stage.

The performance concluded with each of the participating units marching by the audience a final time and the Band playing final pieces. The performance ended about 2010.

The blues band was seated during the entire performance to the rear of the other performances (closest to the Tidal Basin). Chorale members were situated at the front stage for many pieces holding microphones at all times. Chorale members were often moving while they sang, They walked forward, backward, and sideways, at time with their arms in the air, and bodies swaying. They were generally very physically active.

8. Memorial Day Wreath Laying Ceremony

On May 29, 2006, the United States Army Band performed at the wreath laying ceremony at the Tomb of the Unknowns in Arlington National Cemetery. This was attended by Joseph Knapik, Sarah Jones, Sara Canada, and Salima Darakjy.

We observed the Band informally assembled below the Tomb of the Unknowns at about 0930 (they had arrived before that time). Heavy instruments (sousaphones, tuba, etc.) were on the ground and the Band members were talking among themselves. At about 1030 the Band assembled and started playing "The Army Goes Rolling Along," the official song of the United States Army. At approximately 1050, the band came to the Tomb of the Unknowns and stood at attention for the changing of the colors and the 21-gun salute, which indicated the arrival of the President of the United States. Shortly after 1100, the President arrived and the Band began playing the Star Spangled Banner. Once they stopped playing, the Band members remained at attention until 1115, when the events and the crowd moved into the amphitheater.

The band remained at attention for at least 30 minutes and the temperature was approximately 88°F with high humidity. None of the Band members were wearing sunglasses, which could have aided in shielding the sun from their eyes. Musicians dealt with sweat dripping on their faces while at attention by moving facial muscles around to keep sweat out of eyes and mouth. One potential measure to assist in keeping sweat out of the musician's eyes might be to affix a sweat band inside the brim of their hats.

9. Weight and Size of Some Larger Instruments

The weight and size of some musical instruments are shown in Table E1. Only the larger and heavier instruments were weighed. Either a digital scale or force transducer was used for the measurements.

Table E1. Weight and Size of Some Larger Musical Instruments

Instrument	Weight (lbs)	Size (inches)[a]
Bass Drum	18	26X22
Funeral Bass Drum	14	ND
Rope Field Drum	11	16X18
Tenor Drum	8	ND
Sousaphone	34	NA
Saxaphone	9	NA
Cymbal	4	18

[a] ND=No Data Obtained; NA-Not Applicable

APPENDIX F
Stratified Random Sample of US Army Band for Interviews

Unit	Gender	Instrument	Instrumental Group	Interview Group
Blues	Female	Trumpet	Brass	1
	Male	Saxophone	Brass	1
	Male	Percussion	Percussion	1
	Male	Piano	Keyboard	1
Ceremonial	Female	French Horn	Brass	2
	Female	Flute	Woodwinds	2
	Male	Percussion	Percussion	2
	Male	Clarinet	Woodwinds	2
	Male	Euphonium	Brass	2
	Male	Trombone	Brass	2
	Male	Saxophone	Brass	2
	Female	Clarinet	Woodwinds	3
	Male	Tuba	Brass	3
	Male	Trumpet	Brass	3
	Male	Trumpet	Brass	3
	Male	Trombone	Brass	3
	Male	Euphonium	Brass	3
	Male	Trumpet	Brass	3
Chorus	Male	1st Tenor	Vocal	4
	Male	2nd Tenor	Vocal	4
	Male	Baritone	Vocal	4
	Male	Bass	Strings	4
	Male	Piano	Keyboard	4
	Male	Bass	Strings	4
Concert	Female	Oboe	Woodwinds	5
	Female	Flute	Woodwinds	5
	Male	Bassoon	Woodwinds	5
	Male	Clarinet	Woodwinds	5
	Male	French Horn	Brass	5
	Male	String Bass	Strings	5
	Male	Clarinet	Woodwinds	5
	Male	Percussion	Percussion	6
	Female	Clarinet	Woodwinds	6
	Male	Euphonium	Brass	6
	Male	Saxophone	Brass	6
	Male	Trombone	Brass	6
	Male	Trumpet	Brass	6
	Male	Tuba	Brass	6
Strings	Female	Cello	Strings	7
	Female	Viola	Strings	7
	Female	Violin	Strings	7
	Male	Viola	Strings	7
	Male	Violin	Strings	7
Support	Male	Audio/Light	Admin	8
	Male	Audio/Light	Admin	8
	Male	Audio/Light	Admin	8
	Male	Audio/Light	Admin	8
	Male	Audio/Light	Admin	8
	Male	Audio/Light	Admin	8
	Male	Staging	Admin	8
	Male	Staging	Admin	8
	Male	Staging	Admin	9
	Male	Staging	Admin	9
	Male	Staging	Admin	9
	Male	Supply	Admin	9
	Female	Supply	Admin	9
	Male	Transport	Admin	9
	Female	Producer	Admin	9
	Female	Library	Admin	9
Chorale	Female	Alto	Vocal	10
	Female	Soprano	Vocal	10
	Male	Bass	Strings	10
	Male	Tenor	Vocal	10

Appendix G. Description of Profiles from Army Regulation 40-501

Table 7–1
Physical profile functional capacity guide

Profile	P	U	L	H	E	S
Serial	Physical capacity	Upper extremities	Lower extremities	Hearing–ears	Vision–eyes	Psychiatric
Factors to be considered.	Organic defects, strength, stamina, agility, energy, muscular coordination, function, and similar factors.	Strength, range of motion, and general efficiency of upper arm, shoulder girdle, and upper back, including cervical and thoracic vertebrae.	Strength, range of movement, and efficiency of feet, legs, lower back and pelvic girdle.	Auditory sensitivity and organic disease of the ears	Visual acuity, and organic disease of the eyes and lids.	Type severity, and duration of the psychiatric symptoms or disorder existing at the time the profile is determined. Amount of external precipitating stress. Predisposition as determined by the basic personality makeup, intelligence, performance, and history of past psychiatric disorder impairment of functional capacity
1	Good muscular development with ability to perform maximum effort for indefinite periods.	No loss of digits or limitation of motion; no demonstrable abnormality; able to do hand to hand fighting.	No loss of digits or limitation of motion; no demonstrable abnormality; able to perform long marches, stand over long periods, run.	Audiometer average level for each ear not more than 25 dB at 500, 1000, 2000 Hz with no individual level greater than 30 dB. Not over 45 dB at 4000 Hz	Uncorrected visual acuity 20/200 correctable to 20/20, in each eye.	No psychiatric pathology. May have history of a transient personality disorder.
2	Able to perform maximum effort over long periods.	Slightly limited mobility of joints, muscular weakness, or other musculo-skeletal defects that do not prevent hand–to–hand fighting and do not disqualify for prolonged effort.	Slightly limited mobility of joints, muscular weakness, or other musculo-skeletal defects that do not prevent moderate marching, climbing, timed walking, or prolonged effort.	Audiometer average level for each ear at 500, 1000, 2000 Hz, or not more than 30 dB, with no individual level greater than 35 dB at these frequencies, and level not more than 55 dB at 4000 Hz; or audiometer level 30 dB at 500 Hz, 25 dB at 1000 and 2000 Hz, and 35 dB at 4000 Hz in better ear. (Poorer ear may be deaf.)	Distant visual acuity correctable to not worse than 20/40 and 20/70, or 20/30 and 20/100, or 20/20 and 20/400.	May have history of recovery from an acute psychotic reaction due to external or toxic causes unrelated to alcohol or drug addiction.
3	Unable to perform full effort except for brief or moderate periods.	Defects or impairments that require *significant* restriction of use.	Defects or impairments that require *significant* restriction of use.	Speech reception threshold in best ear not greater than 30 dB HL, measured with or without hearing aid; or acute or chronic ear disease.	Uncorrected distant visual acuity of any degree that is correctable not less than 20/40 in the better eye.	Satisfactory remission from an acute psychotic or neurotic episode that permits utilization under specific conditions (assignment when outpatient psychiatric treatment is available or certain duties can be avoided).
4	*Functional level below P3.*	*Functional level below U3.*	*Functional level below L3.*	*Functional level below H3.*	*Visual acuity below E3.*	Does not meet S3 above.

Appendix H
Calculation of Total Weekly Activity for Exercise and Sports Questions and for Instrumentalists Practicing/ Playing and Performing with Instruments

Several questionnaire responses involved the frequency and duration of certain kinds of activity. The total amount of each kind of physical activity was calculated as:

Total Activity (min/wk)=Frequency (times/week) X Duration (min)

While activity frequencies ranged from 0 to 7 and covered each of the possible days per week, durations were in ranges (None, <15 min, 16-30 min, etc.). The approximate midpoints of the duration ranges were selected for the calculation. The durations differed for different questions and the numbers (minutes) selected to represent the range in each question are in Table H1.

Table H1. Numbers Used for Calculation of Total Activity Time

Aerobic Activity		Strength Activity		Sports Activity		Other Activity		Instrumentalist Practice/Performance	
Duration Range on Question (min)	Number Used for Calculation of Total Weekly Activity (min)	Duration Range on Question (min)	Midpoint for Calculation of Total Weekly Activity	Duration Range on Question (min)	Midpoint for Calculation of Total Weekly Activity	Duration Range on Question (min)	Midpoint for Calculation of Total Weekly Activity	Duration Range on Question (min)	Midpoint for Calculation of Total Weekly Activity
None	0	None	0	None	0	0	0	0	0
<15	7	<15	7	<15	7	<15	7	<30	15
16-30	22	16-30	22	16-30	22	15-30	22	30-60	45
31-45	38	31-45	38	31-45	38	31-45	38	61-120	90
46-60	52	46-60	52	46-60	52	46-60	52	121-180	150
>60	67	>60	67	>60	67	61-120	90	181-240	210
						121-180	150	241-300	270
						181-240	210	301-360	330
						241-300	270	361-420	390
						>300	330	>420	450

Appendix I
Studies on Feldenkrais Method and Alexander Technique

This Appendix provides a more detailed summary of studies of Feldenkrais Method and Alexander Technique cited in the text of this paper. Studies generally show positive effects resulting from the practice of both techniques for reducing various types of musculoskeletal discomfort.

1. Studies on Feldenkrais Method

Lundblad et al. (136) examined three groups of female factory workers with neck and shoulder pain. The women were randomized into 3 groups. One group received physical therapy sessions twice a week (50 min) for 16 weeks. Therapy emphasized pain control, stabilizing exercises for the low back, pelvis and shoulders, awareness of body posture, practice in work-related lift and movement techniques, and traditional physical training consisting of strength and flexibility exercises. A Feldenkrais group met once a week (50 min) for 16 weeks and performed both Functional Integration (FI) and Awareness Through Movement (ATM) sessions. A control group received neither intervention. There were a number of drop-outs in the study (defined as not completing all testing and 50% of sessions): 53% in the physical therapy group, 30% in Feldenkrais group, 28% in the control group. The Feldenkrais group reported reductions in complaints in the neck and shoulder and less self-reported disability in leisure time; the physical therapy group reported no change; the control group reported an increase in complaints.

Malmgren and Branholm (140) reported on three groups of patients who had non-specific musculoskeletal complaints (i.e., could not be linked to specific organic causes). One group received 20 Feldenkrais sessions over 4-5 months, another received Body Awareness Therapy in 20 sessions over 4-5 months and the third received traditional physical therapy which varied depending on the patient. The Body Awareness Therapy was similar to Feldenkrais in that it emphasized mental and sensory awareness but the focus was on specific movements involved in daily living like standing, walking, sitting and lying supine combined with breathing movements. Physical therapy was administered by 13 therapists with considerable experience in treating chronic pain patients and involved massage, hot-packs, acupuncture, and the like in combination with mobilization and exercise training and advice on prevention strategies. There were significant self-reported improvements in body pain, vitality, social functioning, emotional and physical well being and general health regardless of the treatment groups after 6 months. However, the Body Awareness Therapy and Feldenkrais groups reported greater improvements than the physical therapy group. On pain self-efficacy (perception for controlling pain) all 3 groups improved after 6 months; after 1 year the Body Awareness Therapy and Feldenkrais group stabilized at the 6 months level but the physical therapy group showed a reduction in their ability to control their pain.

Bearman and Shaferman (137) compared 7 patients with chronic upper body pain who used Feldenkrais Method with 365 other chronic pain patients using a number of other pain management techniques. All 7 Feldenkrais patients reported improvements in pain symptoms after the Feldenkrais classes compared with 56% of the comparison group. Patient satisfaction was 80% in the Feldenkrais group compared to 34% in the control group. Medicaid costs were reduced 40% in the Feldenkrais group. At a 1-year follow-up, patients in the Feldenkrais group "had lost ground in most areas of pain control, function, and quality of life, [but] they were judged generally healthier than at intake".

Brown and Kegerreis (138) measured surface electromyographic (EMG) activity in the trunk musculature in two groups of normal subjects involved in a single Feldenkrais ATM lesson. EMG activity was measured during a complex movement that involved a modified V-sit-and-hold position. Subjects were supine with knees bent and feet on the floor. The right thigh was lifted to a vertical position (90 degrees of hip flexion). With the right hand behind the head and the left arm across the abdomen, the torso was lifted such that the right elbow touched the right knee. The subject held the position for 10 seconds. Three trials of the movements were performed both before and after the Feldenkrais lessons. Ratings of perceived exertion (RPE) and EMG activity in the extensor oblique and

lumbar paraspinal muscles were measured before and after the 45-minute lessons. One group listened to a Feldenkrais tape entitled "Activating the Flexors". The other group listened to the same tape that was modified to remove "elements of kinesthetic awareness, imagery, and visualization as well as cues pertaining to lightness, comfort, and ease." It was found that in both groups, RPE and extensor oblique EMG activity were reduced after the Feldenkrais lessons but lumbar paraspinal EMG activity was not changed after the lessons. There were no differences between the two groups. The authors conclude that the Feldenkrais Method reduced muscular activity and perception of effort during movement and that this reduction was not due to the use of imagery and visualization. The study had no control group (i.e., a group that did not receive any lesson at all), raising the possibility that the groups developed a more economical movement pattern over trials. Reliability of the measure and EMG values over the 6 trials were not presented.

Chinn et al. (139) measured functional arm reach and perceived effort during the reach among individuals with upper back, neck, or shoulder discomfort. Subjects were randomized into one of two groups that either 1) listened to a 22-minute Feldenkrais ATM tape ("Shoulder Clock") (n=12), or 2) listened to a 16-minute neck and shoulder exercise tape (n=11). Functional reach and perceived exertion (visual analog scale) were measured before and after the lessons. Reliability of the functional reach test (intraclass correlation coefficient) was 0.98. After the lessons, the perceived exertion of the Feldenkrais group was reduced by 42% while that of the control group was unchanged. The functional reach of Feldenkrais group was increased by 13% (p=0.10) while that of the control group was decreased by 5% (p=0.43). Since the change in functional reach did not reach p=0.05 it was concluded that the Feldenkrais group did not improve functional reach. However, the low statistical power of the study (few subjects) should be considered in interpreting the findings. Nevertheless the results were generally favorable for the Feldenkrais group.

James et al. (142) measured hamstring flexibility in 3 groups that either 1) completed 4 taped Feldenkrais ATM lessons, 2) completed 4 relaxation tapes, or 3) received no treatment. The flexibility measure was taken prior to the lessons, before the fourth taped lesson, and after the fourth taped lesson. Test-retest reliability of the flexibility measure over a 30-minute period was 0.93 (Pearson-product moment coefficient). There were no significant differences among the groups or measurement periods and there was no significant interaction.

Ruth and Kegerreis (135) found that after 15 minutes of Feldenkrais ATM instruction individuals were able to achieve greater neck flexion with less perceived effort than a control group who had not received this instruction. The ATM lessons were not described in the article and the control group did not receive a sham treatment (they performed random activity of their choice). The authors admit that that the movements performed during the Feldenkrais training could have resulted in contraction of the neck muscles influencing neck range of motion.

Gutman et al. (141) found no difference in weight, blood pressure, resting heart rate, rotational flexibility, or performance on balance beams between groups of elderly retirement home residents who were assigned to either 6 weeks of Feldenkrais training or 6 weeks of traditional exercise training (walking, running in place, calisthenics). After both programs, participants reported similar improvements in perceived energy levels. However, compared to the traditional exercise group, the Feldenkrais group reported 1) less worry about health, 2) greater health improvements, and 3) better sleep. The latter 3 findings were not statistically significant but statistical power of this study was severely limited by the fact that only 63% (n=19) of the Feldenkrais group and 54% (n=13) of the traditional exercise group completed at least half of the sessions and all the pre/post testing.

2. Studies on Alexander Technique

There are fewer investigations on Alexander Technique compared to Feldenkrais Method, but studies on Alexander Technique generally show positive effects.

Cacciatore et al (132) reported on a case study of a 49-year old woman with a 25-year history of daily, left-sided idiopathic lumbrosacral pain. The patient received 20, 45-minute Alexander Technique lessons over 6 months. After the lessons the patient had substantial improvements in postural control and balance and had substantially reduced her subjective pain rating.

Stallibrass et al. (143) found that individuals with Parkinson's Disease who received lessons in Alexander Technique showed less difficulty performing daily tasks, less difficulty on self-reported fine and gross movements, a more positive body concept, and less depression. This study had no control group so Stallibrass et al. followed up with another investigation. In a randomized control trial of Parkinson's Disease patients, those receiving Alexander Technique lessons (24 sessions) improved on the Parkinson's disability scale both at the best and worst times of the day and were less depressed compared to the group with no intervention. Improvements in self-reported disability were maintained 6 months after training (144).

Functional reach (the ability to reach forward while maintaining a fixed base of support in the standing position) was improved by 22% after 8 sessions of Alexander Technique in older women. Functional reach declined 6% in a control group that did not receive Alexander Technique lessons (145).

Austin and Ausubel (146) performed standard respiratory function tests on 10 normal individuals taking Alexander Technique lessons and 10 individuals who did not. Respiratory function tests were given before the lessons and about 7 months later. Twenty Alexander Technique lessons (35 to 45 minutes) were provided. Individuals taking the lessons improved in peak inspiratory flow (9%), maximum voluntary ventilation (6%), maximum inspiratory mouth pressure (12%), and maximum expiratory mouth pressure (9%). There were no changes in the control group.

Differences in movement patterns could be demonstrated by biomechanical techniques after a single Alexander Technique lesson when that session was designed to inhibit certain habitual postural sets. Subjective responses indicated a considerable reduction in the effort required for the movement and that reduction in effort appeared to persist for up to at least one year (147, 148).

Appendix J
Acknowledgements

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